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# THE LONDON NATURALIST

Journal of the
LONDON NATURAL HISTORY SOCIETY

No. 75 1996

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# LONDO SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32-km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises Sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology, or rambling, there is a Section ready to help.

**Publications**

*The London Naturalist*, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The *London Bird Report*, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

**Indoor meetings**

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

**Field meetings**

Led by experts to visit interesting natural localities, both within and outside our Area. These excursions are very popular with beginners wishing to increase their knowledge, and enable members to get to know one another.

**Library**

A large selection of books and journals on most aspects of natural history is available for loan or consultation by members free of charge.

**Reading circles**

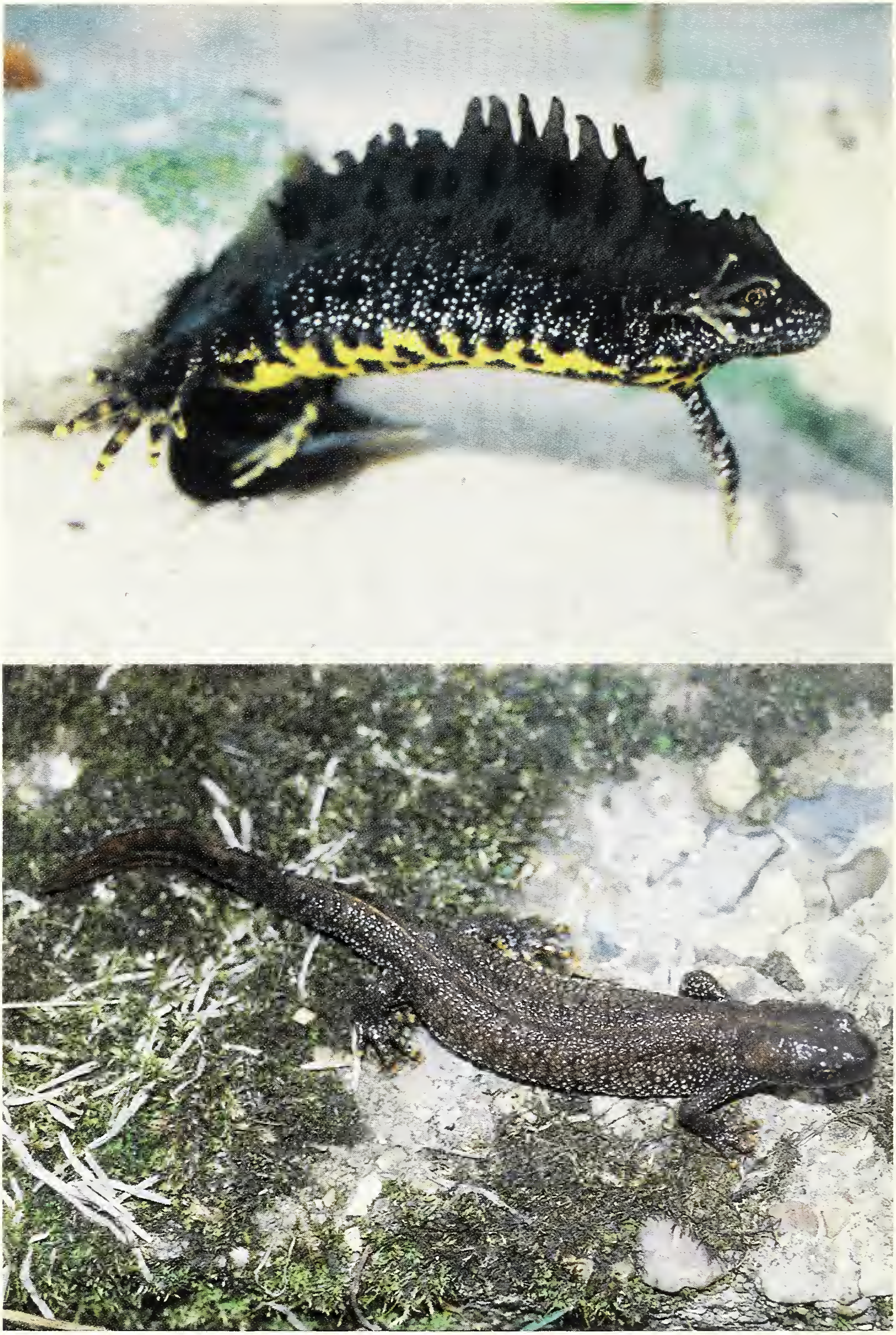
Many important natural history journals are circulated by the Sections at a fraction of the cost of subscribing direct.

## SUBSCRIPTIONS

| | |
|---|---|
| ORDINARY MEMBERS | £10.00 |
| JUNIOR MEMBERS | £5.00 |
| SENIOR MEMBERS | £5.00 |
| FAMILY MEMBERS | £2.00 |
| CORPORATE SUBSCRIBERS | £10.00 |

Junior membership is for persons under 18, or under 25 and receiving full-time education, and senior membership is for persons over 65 who have been continuous members of the Society for ten complete years. All except family members receive one free copy of *The London Naturalist* and the *London Bird Report* each year. Cheques and postal orders, payable to the London Natural History Society, should be addressed to:

The Membership Secretary, LNHS, P. C. Holland,
Flat 9, Pinewood Court, 23 Clarence Avenue,
London SW4 8LB



The crested newt *Triturus cristatus* (male top, female bottom) is highly protected in Britain, but is in decline.

*Photos: William Atkins, London Amphibian and Reptile Group*

# THE LONDON NATURALIST

## Journal of the LONDON NATURAL HISTORY SOCIETY

## No. 75

for the year 1995

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# LONDON NATURAL HISTORY SOCIETY

**Founded 1858**

### President

Colin Bowlt, B.SC., PH.D.
7 Croft Gardens, Ruislip, Middlesex HA4 8EY

### Honorary Vice-Presidents

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**Treasurer**: M. J. West, 52 Trinity Road, Ware, Hertfordshire SG12 7DD.

**Membership Secretary**: P. C. Holland, Flat 9, Pinewood Court, 23 Clarence Avenue, London SW4 8LB.

**Librarian**: J. W. Barrington, MA, ALA, c/o Central Libraries, Imperial College, London SW7 2AZ.

**Publications Sales Secretary**: Vacant.

**Editor**, *The London Naturalist*: K. H. Hyatt, c/o Dept of Zoology, The Natural History Museum, Cromwell Road, London SW7 5BD.

**Editor**, *London Bird Report*: M. A. Hardwick, The Garden Flat, 13 Southcote Road, London N19 5BJ.

**Editor**, *Newsletter*: M. Thain, MA, B.SC., Upper Cairnryan, Harrow Park, Harrow, Middlesex HA1 3JE.

**Editor**, *Ornithological Bulletin*: D. J. Montier, Eyebrook, Oldfield Road, Bickley, Bromley, Kent BR1 2LF.

**Elected Members of Council**: J. F. P. Bennett, M. J. Earp, Mrs L. Hewitt, Dr J. Hewlett, Miss J. Shane, M.SC., J. M. W. Topp.

**Representative Members of Council**: Bookham Common — Mrs R. M. Pride; Botany — Dr M. C. Sheahan; Ecology and Entomology — J. A. Thompson; Ornithology — J. W. Barrington; Ramblers, Archaeology and Geology — Miss D. E. Woods; South-West Middlesex — R. G. Bowden.

# The Society's recorders

## Botany

**Bryophytes**: Dr K. J. Adams, 63 Wroths Path, Baldwins Hill, Loughton, Essex IG10 1SH.

**Flowering plants and vascular cryptogams**: R. M. Burton, MA, FLS, Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent DA4 0JJ (01322 863216)

## Ecology and entomology

**Mammals**: C. Herbert, 67a Ridgeway Avenue, East Barnet, Hertfordshire EN4 8TL (0181-440 6314)

**Reptiles and amphibians**: T. E. S. Langton, B.SC., 12 Millfield Lane, London N6 6RA (01986 784518)

**Fishes**: Dr Ruth Kirk, School of Biological Sciences, Royal Holloway, University of London, Egham, Surrey TW20 0EX (01784 443266)

**Arachnida**: J. E. D. Milner, 80 Weston Park, London N8 9TB (0181-341 2158)

**Coleoptera**: M. Barclay, 47 Tynemouth Street, London SW6 2QS (0171-371 9095)

**Coleoptera (Carabidae)**: P. R. Mabbott, 55 Murchison Road, London E10 6NA

**Coleoptera (Lucanidae and Buprestidae)**: Dr D. S. Hackett, 3 Bryanstone Road, London N8 8TN (0181-292 6134)

**Lepidoptera, Syrphidae, and invertebrates not otherwise listed**: C. W. Plant, B.SC., FRES, 14 West Road, Bishop's Stortford, Hertfordshire CM23 3QP (01279 507697)

**Orthoptera**: D. S. Martin, 121 Devonshire Road, Hornchurch, Essex RM12 4LP

**Heteroptera**: E. W. Groves, 143 Westleigh Avenue, Coulsdon, Surrey CR5 3AF

**Odonata**: Ms Ruth Day, B.SC., 18 Zenoria Street, London SE22 8HP (0181-693 4259)

**Plant galls**: K. Hill, BA, FLS, 93 Elmhurst Drive, Hornchurch, Essex RM11 1NZ (01708 456652)

**Mollusca**: Ms Jane Reynolds, DIP. HORT. (Kew), 21c Loraine Road, London N7 6EZ (0171-700 6258)

## Geology

Vacant

## Ornithology

**Inner London**: M. A. Hardwick, The Garden Flat, 13 Southcote Road, London N19 5BJ

**Kent and Lower Thames (London Bridge to Tilbury)**: A. J. Morris, 134 Station Road, Crayford, Kent DA1 3QQ

**Surrey and Upper Thames (Wandsworth to Staines)**: S. J. Spooner, 32 Berkeley Drive, West Molesey, Surrey KY8 1RA

**Middlesex**: C. Lamsdell, 4 Hardings Close, Iver Heath, Buckinghamshire SL0 0HL

**Buckinghamshire**: A. V. Moon, 46 Highfield Way, Rickmansworth, Hertfordshire WD3 2PR

**Hertfordshire**: A. Wilson, 14 Marina Gardens, Cheshunt, Hertfordshire EN8 9QY

**Essex**: D. Lambert, 10 Chandos Road, London N17 6HN

Records may be sent to the appropriate recorder (where shown) or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Requests for information should be made to the appropriate recorder.

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# Report of the Society for 1995

**Approved at the Annual General Meeting on 12 December 1995**

It is with deep regret that we record the deaths of A. J. M. Bailey, J. C. Cadbury, A. D. Day, Mrs F. M. Murphy, H. W. Mackworth-Praed, B. E. Knell and Miss K. E. Springett. Total membership of the Society is now 1,251 comprised as follows:

| | |
|---|---|
| Ordinary | 939 |
| Family | 123 |
| Junior | 7 |
| Senior | 125 |
| Honorary | 23 |
| Life | 7 |
| Affiliated | 27 |

The Council has appointed W. G. Teagle an honorary member of the Society.

The highlight of the Society's year was the publication of *Bird-watching in London* by E. M. Nicholson. The book was successfully launched at the Linnean Society rooms on 22 November 1995. We are deeply indebted to Max Nicholson for donating the material to the Society; we extend our thanks to members of the Publications Working Group for their efforts in arranging the publication, and in particular to Mike Earp who edited the book. Work is continuing on the new *Atlas of breeding birds*, but no date for publication can yet be fixed.

The new Nature Conservation Working Group (established in 1994) has had its first meeting — the Group was set up to act as a forum for Society members working on different aspects of nature conservation. It is hoped that the Working Group will be able to assist the Conservation Officer in his work by offering informed advice on sites of nature conservation importance in our area. Threats to sites of nature conservation continued unabated. At Beddington Sewage Works the joint efforts of many environmental organizations including ourselves were of no avail and a phased programme of gravel extraction will now go ahead.

We were more successful at Branch Hill, Hampstead where Camden Council were persuaded to remove their proposals for development of an ecologically important site adjacent to the Heath. We are grateful to all who helped in achieving this satisfactory outcome, but in particular to Ray Softly and Brian Wurzell. Our Conservation Officer, David Bevan, gave evidence at the Public Inquiry into the future of the grounds at Friern Barnet Hospital; the Inspector's report is awaited. The possibility of a fifth terminal at Heathrow Airport is causing us concern; the Society will be offering support to the London Wildlife Trust at the Public Inquiry.

The Society continues to work with all its surrounding wildlife trusts, and again we took a table at the Annual Exhibition of the Amateur Entomologists' Society.

It has been a busy year at Bookham. Five study days were held during the summer — Council very much welcomes this splendid initiative. Bookham Common is an excellent teaching ground, and the Society is fortunate in having such a dedicated band of volunteers who are continuing the work of the survey into its second half century — a fuller report of the work at Bookham and the other sections will be published in *The London Naturalist.*

Most sections are still suffering from a shortage of officers, but meetings both indoor and in the field continue to enjoy the support of members and friends. The structure and administration of the Society are being reviewed; a report will follow in due course.

The Society gave a grant to the London Amphibian and Reptile Group to help with its work on research connected with the crested newt.

A social evening held in October was well supported as were the open evenings held at the library. Work has continued on the computerized book catalogue — the quality and quantity of the books in our library will be considered within the review of structure and administration previously mentioned. As ever we are indebted to Imperial College staff for all their help.

Sales of the Society's publications remain steady; our latest journals have been well received and continue to be held in high regard by the natural history community at large. Our thanks go to our editors and indeed to all our hard-working officers without whose efforts the Society would not function.

## Statement of trustees' responsibilities

Charity law requires the trustees to prepare financial statements for each financial year which give a true and fair view of the state of affairs of the charity and of its financial activities for that period. In preparing those financial statements the trustees are required to:

— select suitable accounting policies and then apply them consistently;

— make judgements and estimates that are reasonable and prudent;

— state whether applicable accounting standards have been followed subject to any material departures disclosed and explained in the financial statements; and

— prepare the financial statements on the going concern basis unless it is inappropriate to presume that the charity will continue in business.

The trustees are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the charity and to enable them to ensure that the financial statements comply with the Charities Act 1992. They are also responsible for safeguarding the assets of the charity and for taking reasonable steps for the prevention and detection of fraud or other irregularities.

## Treasurer's report for 1994/95

The Society's accounts for the financial year ended 30 June 1995 show a surplus of £2,525 (after making provision for the diminution in value of investments where the current market value is less than the book value), compared with a surplus of £13,737 in 1993/94. Overall levels of income and expenditure were very similar to last year's.

Total income was £52,587, slightly above last year's figure of £52,145. Within this total, subscription income fell slightly to £10,557, investment income rose by 10 per cent to £17,503 and we realized £18,635 profit on the sale of investments. Sales of the Society's publications raised £1,780 (net) compared with £4,917 last year, when receipts were enhanced by sales of the newly published *Larger moths of the London Area.*

Total expenditure rose by 2 per cent from £44,424 in 1993/94 to £45,470. Expenditure on grants fell from £2,626 to £742, reflecting a reduction in the number and scope of suitable applications. Increased costs were incurred in a number of areas, including the Society's library; computer software (for bird recording); and production and mailing of *The London Naturalist.*

## Report of the auditors to the members of the London Natural History Society

We have audited the financial statements on pages 9 to 10 which have been prepared under the accounting policies set out on page 10.

### Respective responsibilities of trustees and auditors

As stated in the Treasurer's report, the Society's Council as trustees are responsible for the preparation of financial statements. It is our responsibility for form an independent opinion, based on our audit, on those statements and to report our opinion to you.

### Basis of opinion

We conducted our audit in accordance with Auditing Standards issued by the Auditing Practices Board. An audit includes examination, on a test basis, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgements made by the trustees in the preparation of the financial statements, and whether the accounting policies are appropriate to the Society's circumstances, consistently applied and adequately disclosed.

We planned and performed our audit so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or other irregularity or error. In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial statements.

### Unqualified opinion

In our opinion the financial statements give a true and fair view of the state of the Society's affairs as at 30 June 1995 and of its results for the year then ended.

4 London Wall Buildings
LONDON EC2M 5NT
11 December 1995

FRASER RUSSELL
Chartered Accountants
and Registered Auditors

# London Natural History Society Income and Expenditure Account for the year ended 30 June 1995

| 1994 £ | 1994 £ | Income | 1995 £ | 1995 £ | 1995 £ |
|---|---|---|---|---|---|
| | | **Income from members and supporters:** | | | |
| | 10,776 | Subscriptions | | 10,557 | |
| | 585 | Donations | | 408 | |
| | 594 | Tax recovered on covenanted subscriptions | | 763 | |
| | — | Bequests | | 1,000 | |
| 11,955 | | | | | 12,728 |
| | | **Sales:** | | | |
| | 1,592 | Journals | 1,217 | | |
| | (190) | *Less*: Expenses | (174) | | |
| 1,402 | | | | 1,043 | |
| 24 | | Journal offprints | | 250 | |
| | 288 | *Flora of the London Area* | 142 | | |
| | (69) | *Less*: Expenses | (25) | | |
| 219 | | | | 117 | |
| | 277 | *Butterflies of the London Area* | 125 | | |
| | (53) | *Less*: Expenses | (36) | | |
| 224 | | | | 89 | |
| | 3,877 | *Larger moths of the London Area* | 364 | | |
| | (829) | *Less*: Expenses | (83) | | |
| 3,048 | | | | 281 | |
| 44 | | Literature and surplus library stock | | 25 | |
| 54 | | Chipperfield Bequest | | — | |
| 20 | | Other | | 7 | |
| | | | | | 1,812 |
| | | **Income from investments and deposits:** | | | |
| | 15,934 | Quoted investments | 17,503 | | |
| | 5,144 | Tax recoverable | 5,433 | | |
| | 21,078 | | | 22,936 | |
| | 211 | Investment cash account | | 285 | |
| | 17,730 | Profit on sale of investments | | 18,635 | |
| | 39,019 | | | 41,856 | |
| | (4,005) | *Less*: Custodian's charges | | (3,981) | |
| 35,014 | | | | | 37,875 |
| | 53 | Charities deposit fund | | 55 | |
| | 88 | Bank deposit account | | 117 | |
| 141 | | | | | 172 |
| 52,145 | | **Total income** | | | 52,587 |
| (44,424) | | *Less*: **Expenditure** | | | (45,470) |
| 7,721 | | | | | 7,117 |
| 6,016 | | (Increase)/decrease in the provision for diminution in value of certain investments | | | (4,592) |
| £13,737 | | Surplus for the year | | | £2,525 |

| 1994 £ | 1994 £ | Expenditure | 1995 £ | 1995 £ |
|---|---|---|---|---|
| | | **Meetings costs, sectional and general expenditure:** | | |
| | 1,956 | Hire of halls and rooms | 2,141 | |
| | 947 | Lecturers' fees and expenses, sectional expenses, etc. | 1,188 | |
| | 867 | Postage and telephone | 920 | |
| | 210 | Stationery | 633 | |
| | 2,740 | Services (auditors' fees, insurance, etc.) | 3,138 | |
| | 21 | Equipment repairs and renewals | 53 | |
| | 572 | Honoraria and expense allowances | 1,402 | |
| | 120 | Computer software and sundries | 2,403 | |
| | 12 | Catering (net) | — | |
| | 1,697 | Depreciation | 1,603 | |
| | 334 | Bank charges | 538 | |
| | (11) | Sundry | — | |
| | 850 | Rent | 79 | |
| 10,315 | | | | 14,098 |
| | | **Publications:** | | |
| | | Printing and expenses: | | |
| | 6,465 | *London Naturalist* **73** | 10,850 | |
| | 4,666 | *London Bird Report* **58** | 4,027 | |
| | 10,795 | *Larger moths of the London Area* | — | |
| | — | Geology map | 4,658 | |
| 21,926 | | | | 19,535 |
| | 1,232 | *Programme* | 596 | |
| | 3,643 | *Bulletin* and *Newsletter* | 2,878 | |
| | 3,473 | Mailing | 5,450 | |
| 8,348 | | | | 8,924 |
| 817 | | **Library** | | 1,806 |
| 392 | | **Publicity** | | 365 |
| 2,626 | | **Grants,** including contributions to other organizations | | 742 |
| £44,424 | | **Total expenditure for the year** | | £45,470 |

# Balance Sheet as at 30 June 1995

| 1994<br>£ | £ |  | 1995<br>£ | £ |
|---|---|---|---|---|
|  |  | **Fixed assets** acquired after 30 June 1985, excluding library books: |  |  |
|  | 13,857 | Computers, including ancillary equipment and initial programming costs | 16,015 |  |
|  | 143 | Library equipment | 143 |  |
|  | 2,053 | Other indoor equipment | 2,053 |  |
|  | 413 | Bat detectors | 248 |  |
|  | 2,158 | Bookham hut | 2,158 |  |
|  | 18,623 |  | 20,617 |  |
| 1,257 | (17,348) | *Less*: Depreciation | (18,786) | 1,831 |
|  | 235,799 | **Quoted investments** at cost | 238,631 |  |
| 231,531 | (4,268) | *Less*: Provision for diminution in value of certain investments | (8,860) | 229,771 |
|  |  | (Market value £370,434 — 1994; £375,832) |  |  |
|  |  | **Current assets** |  |  |
|  |  | Funds at bank and on deposit: |  |  |
|  | 15,685 | National Westminster Bank PLC | 21,434 |  |
|  | 1,000 | Charities deposit fund | 1,000 |  |
|  | 16,685 |  | 22,434 |  |
|  | 667 | Cash in hand | 886 |  |
|  | 283 | Payments in advance and other debtors | 262 |  |
|  | 3,437 | Tax recoverable on investment income | 1,464 |  |
| 21,492 | 420 | Stationery stocks | 450 | 25,496 |
|  |  | *Less*: Current liabilities |  |  |
|  | (4,005) | Custodian's charges | (3,981) |  |
| (4,524) | (519) | General liabilities and accrued expenditure | (818) | (4,799) |
| £249,774 |  | **Total net assets** |  | £252,299 |
|  |  | Representing: *General Fund* (incorporating the Hindson and Castell Bequests) |  |  |
| 236,037 |  | Balance at 30 June 1994 |  | 249,774 |
| 13,737 |  | Surplus for the year |  | 2,525 |
| £249,774 |  |  |  | £252,299 |

C. BOWLT President
M. J. WEST Treasurer
11 December 1995

## Note to the accounts

*Accounting policies*

a) Subscriptions, which are collected on a calendar year basis, continue to be brought in as received. No account is taken of subscriptions in arrears until received.

b) Investment income is credited to the Income and Expenditure account together with the income tax credit receivable.

c) Provision is made for all material debtors, prepayments, creditors and accruals with the exception of subscription income (see note a above).

d) Depreciation is provided on fixed assets at rates calculated to write off the cost of each asset over its expected useful life as follows:

Computer equipment — $33\frac{1}{3}$%
Other assets — 20%

e) The London Natural History Society is registered as a charity (Charity Commission Reference 206228) and as such tax exemptions apply to the income arising from and expended on its charitable activities.

# Official and sectional reports for 1995

## CONSERVATION

This year saw the first meeting of the Nature Conservation Working Group which was set up in 1994 to act as a forum for LNHS members working on different aspects of nature conservation. The meeting, held in February, was chaired by the Society's Conservation Officer, with Ruth Day acting as secretary. It was hoped that the Working Group would be able to assist the Conservation Officer in his work by offering advice on sites of nature conservation importance around London. The Secretary was hoping to build up information on such sites based on listings from the London Ecology Unit. Members of the Working Group agreed to contribute habitat details from the sites in their own boroughs. In July, Dr David Dawson, of the London Ecology Unit, addressed a joint meeting of the Conservation Working Group and the Botany Section on 'Methods of Site Survey'. This well-attended meeting was followed, ten days later, by a site visit to Wandle Meadows Nature Park in Merton, where theory was put into practice.

Threats to sites of nature conservation importance continue unabated around London and the Society has been involved in the defence of many of them both through our links with the wildlife trusts and also directly through the efforts of our own members. At Beddington Sewage Works, our joint efforts with the London Wildlife Trust, the Surrey Wildlife Trust, and many other environmental organizations failed to persuade the public inquiry inspector of the site's ornithological importance and a phased programme of gravel extraction followed by large-scale landfill will now go ahead.

We were more successful at Branch Hill, Hampstead, where Camden Council were persuaded to remove their proposals for a built development on an ecologically important site adjacent to the Heath. The joint efforts of Ray Softly and Brian Wurzell on behalf of the Heath and Old Hampstead Society, in preparing an excellent proof of evidence, were critically important to this successful outcome.

A public inquiry into the future of the grounds of Friern Barnet Hospital, at which the Conservation Officer gave evidence, is still awaiting the inspector's report at the time of writing.

The more far-reaching consequences of the possible construction of a fifth terminal at Heathrow Airport are also causing concern to many environmental organizations. The London Wildlife Trust will be giving evidence at the continuing public inquiry and this Society will be offering support.

DAVID BEVAN, *Conservation Officer*

## BOTANY

We have had another active year in the Botany Section. On 18 January Barry Hilling talked on the wild orchids of Britain, on 6 June Miles King spoke on Plantlife and conservation, and at the AGM in November we had an illustrated talk on trees and woodland by Rose Pride. On 14 March there was a general meeting when Ian Swinney gave a talk about Bookham Common. There were three informal meetings: the best slides of the year was a relaxed evening with the opportunity to enjoy some of the past year's botanical pleasures, and at the two general identification meetings members were able to learn a lot of useful tips for the recognition of some of the more difficult plant groups.

There were field meetings on most weekends in the growing season both in London (Putney towpath, Kensal Green, Railway Fields in Haringey) and further out in all directions (for example Crayford Marshes, a joint meeting with the Kent Field Club, Petts Wood and Harty Ferry in Kent; the Grand Union Canal in Middlesex; Epping Forest in Essex; the Warburg Reserve in

Oxfordshire; Banstead Heath, Staines Moor, Sheepleas, Norbury Park, St Martha's Hill and Hampton Court in Surrey; and even a visit to David Bevan's idyllic bit of English countryside in Ashdown Forest in Sussex). The season ended with the ever-popular fungus foray in Haringey. All meetings provided much to see and enjoy in spite of the drought conditions in the latter part of the season, and many of the participants commented on how much they had been able to learn, especially by comparison of difficult pairs of species. We are very grateful to all who have given talks and led walks for us.

Some members of the Section have already begun recording in their local 10-kilometre squares in preparation for the BSBI's Atlas 2000 project, for which Rodney Burton is the co-ordinator for London and the Home Counties, and in the next two years there will be recording meetings in squares which are not well covered.

We are pleased to welcome Chris Mulvey onto the committee, and accept with regret the resignations of Ruth Day and Ivor Fishman. We thank them for their work on the committee, and also thank all the other officers and members of the committee.

RODNEY BURTON, *Chairman*, MARY CLARE SHEAHAN, *Secretary*

## ECOLOGY AND ENTOMOLOGY

The Section has continued to arrange a series of stimulating lectures of interest not only to entomologists but to all naturalists. In February we heard from Paul Canneaux, Superintendent of Hampstead Heath, on the problems of tackling nature conservation there. In April Dr June Chatfield spoke on the continuing struggle to preserve the rich and varied habitats of Nonsuch Park and the adjoining areas of Warren Farm and Cherry Orchard Farm from development. The Parmenter Lecture was given in July by Dr David Goode of the London Ecology Unit on habitat creation in towns. September saw the institution of the Brad Ashby Memorial Lecture at the annual joint meeting of the LNHS and the British Entomological and Natural History Society. Both societies agreed that this was a fitting tribute to a man who had done so much to forge links between them. The talk was given by Colin Plant exploring the feasibility or desirability of a Red Data list for London's invertebrates. At the Section's AGM in October Ray Softly reviewed the changes in the habitat, flora and fauna of the North London Heights over the past century.

The Section's field meetings are social occasions when members observe and record forms of wildlife of interest to them. Records generated by the number of eyes, ears, hands and brains involved in field meetings can help in site management and wildlife conservation. Two field trips were arranged to follow up talks. In July members visited the west side of Hampstead Heath where recent habitat management, including thinning of undergrowth, some seeding, and pond restoration, led in part to a variety of invertebrates being recorded. In October a visit to Nonsuch Park was arranged to show solidarity with efforts to save the site from development. As it was late in the year, not a great many invertebrates were found. Edward Milner led two further field trips in search of spiders, in May to Bentley Priory and in December to Bushy Park. Results of his recording appear elsewhere in this journal. In November members were the guests of Hertfordshire Wildlife Trust to examine the results of their mammal-trapping programme. Unfortunately only one pygmy shrew had been caught during the previous night.

At our committee meetings we have been discussing the role of recorders. The wide range of taxa and the specialist knowledge required to identify accurately even common species of some invertebrates makes the task of the Section particularly challenging. During the year there was a meeting of invertebrate recorders to explore various recording software and to establish paths of communication among themselves and with national and adjacent recording organizations. In the course of the year we have accepted with regret the resignations of the following recorders: Alwyne Wheeler (Fishes), Stephen Brooks (Odonata) and Fred Naggs (Mollusca). We warmly welcome newly elected recorders Dr Ruth Kirk (Fishes), Mr Maxwell Barclay (Coleoptera) and Mr Paul Mabbott (Carabidae). This is the first time in a quarter of a century that the Society will be actively recording beetles.

Once again members of the Section represented the Society at the Annual Exhibition of the Amateur Entomologists' Society in October which resulted in the enrolment of several new members.

JOHN A. THOMPSON, *Chairman*, CATHERINE SCHMITT, *Secretary*

## ORNITHOLOGY

During the year the Section has organized an interesting and varied programme of indoor meetings and a good programme of field meetings which have been well supported. Indoor meetings included talks on Antarctica by Tony Marr, the Andes by Barry Trevis and Poland by John Wyatt. Nearer to home David Walker spoke about Dungeness and the Calf of Man. Two talks devoted to single species were 'The Great Tit' by Andy Gosler and 'Roosting Harriers' by Roger Clark. Our member, Derek Coleman, who is the London BTO Regional Representative, spoke about the new BTO Breeding Bird Survey.

There has been a good response from people wanting to take part in the new Breeding Bird Survey. It is an important survey designed to monitor common species across all types of habitat and requiring less time than the Common Birds Census and Waterways Bird Survey. A number of common species — mostly associated with farmland — have undergone a serious decline in recent years. The house sparrow is one of these, and about 40 members are now monitoring them in their gardens. This is a long-term survey to plot trends.

A number of members have been involved in the Wildfowl and Wetlands Trust's London Lakes Rehabilitation project. The monthly counts have provided the Trust with useful data. Sightings of darvic-ringed birds show that there is considerable interchange between sites, and some geese are moving from central London to the outer parts of the London Area if not beyond.

Congratulations are due to Mark Hardwick and his team who produce the *London Bird Report*. The magazine *British Birds* runs a competition for the best annual bird report: the 1993 *LBR* came joint second with Hertfordshire.

HELEN BAKER, *Chairman*, VICKI HARLEY, *Secretary*

## RAMBLERS, ARCHAEOLOGY AND GEOLOGY

The year has been quite a satisfactory and interesting one with, not surprisingly, more people attending in the winter than in the summer, when of course there are other attractions. However, we have been relying mostly on committee members and a few loyal supporters to lead rambles. We would like a few more leaders for both Ramblers and Archaeology as well as Geology. We usually get people with a general knowledge of natural history and local history, and we have this year visited all parts of the London area at a leisurely pace.

RICHARD E. BUTLER, *Chairman*, DOREEN E. WOODS, *Secretary*

## SOUTH-WEST MIDDLESEX

The Section has had a successful year — at the AGM all the officers were willing to stand again and were re-elected. There is the continuing concern, however, that as the numbers at the indoor meetings are small, by what means will we be able to get an injection of new blood, which must eventually be required, for the committee.

During 1995 we organized seventeen field meetings. The average attendance was ten. In the fungus foray on Hounslow Heath, led by the warden Martin Holt, we had a joint meeting with the Spelthorne Natural History Society.

We have been to Richmond Park, Bedfont Lakes, Hampton Court, Wraysbury Gravel Pits, River Bourne (Virginia Water), Crane Park, Welsh Harp (Hendon), Thursley Common, Penton Hook (Staines), Causeway Gravel Pits (Hounslow), Staines Reservoirs, Bushy Park, Hounslow Heath, Broadwater Gravel Pit (Harefield), Littleton Lakes, and Kew Gardens.

Our leaders, most of them yearly regulars, were Ruth Turner, David Harris, Tony Leppard, Peter Williams, Marjorie Shattock, Mark Radford, Martin Holt, Richard Holleyman, and Ray Bowden.

The subjects and speakers of our seven indoor meetings were: Thailand — Ken Willis, Wildlife and Scenery in Scotland — Mr and Mrs Holcombe, Coast and Countryside — R. W. G. Smith, Views of Life — David Yendall, AGM and quiz, Barn Elms — Mandy Wilson, and Members' Slides. The average attendance was fifteen.

RAY G. BOWDEN, *Chairman*, MARK RADFORD, *Secretary*

# 'London's Natural History' (New Naturalist No. 3) fifty years on

COLIN BOWLT

*7 Croft Gardens, Ruislip, Middlesex HA4 8EY*

**Presidential Address delivered at the Annual General Meeting on 12 December 1995**

Fifty years ago, in 1945, the New Naturalist series of books was started by Collins, the publishers. Number 3 in the series was entitled *London's Natural History* by Richard S. R. Fitter. It actually came out at the same time as the first volume in the series, *Butterflies* by E. B. Ford (number 2 didn't appear until the following year). The advent of the New Naturalists was a landmark in natural history publishing and many budding naturalists of that time and subsequently were strongly influenced and inspired by them. One of our recent speakers mentioned that when he was young the volumes on *Butterflies* and on *Moths* were his bibles. The editors' stated 'aim of the series is to interest the general reader in the wild life of Britain by recapturing the enquiring spirit of the old naturalists ...'. In particular many of the illustrations used 'the latest methods of colour photography and reproduction'. Whilst these do not seem anything very special today I can well remember being excited by them when I first came across the New Naturalists in the early 1950s.

Fitter's book reviewed London's natural history from earliest times down (or should it be up) to 1944, describing the growth of Britain's capital and the effect on its wildlife. World War II, which had just ended, had influenced natural history in London in a number of interesting ways. One was that it had temporarily brought the rural scene back to parts of London again. Sheep were grazed on golf-courses and even parklands (as illustrated in the colour plate of sheep at Ken Wood House), allotments were created, chickens were kept in gardens, and playing-fields were ploughed for crops. But perhaps the most dramatic happening was the invasion of wildlife onto the derelict bomb-sites, particularly in the City. In 1947 the Ecological Section of our Society commenced a survey of the extensive bombed area around Cripplegate and the fascinating findings were published in this journal over several years following. When the City was largely destroyed by the Great Fire of 1666 it is recorded that London rocket sprang up in great profusion. Today it is an uncommon and non-invasive plant in the London area (with a patch by Tower Bridge, for example). A Fitter illustration shows a bomb-site with Oxford ragwort, rosebay and Canadian fleabane, but no buddleia. Buddleia was recorded as rare during the survey (Wrighton 1950) and yet today it is perhaps the most characteristic plant of deserted sites in the London area, rapidly appearing on derelict places similar to the bomb-sites.

Fifty years ago there were still horse-drawn vehicles in London leaving trails of hay, oats and manure providing a source of food for birds, such as the house sparrow, and no doubt much other less visible wildlife, as well as being a source of seeds for the bomb-sites (Jones 1958) including lucerne, lady's bedstraw and twenty-one species of grass. There were more food markets then. Those that remain produce much less waste, handling food which is already prepared for sale, although I still occasionally see black-headed gulls swoop down to scavenge a meaty morsel and then to be chased by a group of fellow gulls at Smithfield Market. Some birds seem to have hung on to London not for anything special that it provides, but from sheer force of habit relating back to when no part of London was far from the open countryside. The last rooks nested in inner London in 1916 in Temple Gardens. Fifty years ago they still nested at Lee Green, six and a half miles from St Paul's. Today the nearest nests are about twice as far out. Swallows are another species that keep moving farther out as London grows larger and fills in the green gaps. Fitter (1949) recorded a pair nesting in Eccleston Square in 1941, presumably in a bombed building, and a pair nested in the deer-shed at Golders Hill Park in 1952, but today they only nest around the edges of our recording area.

Minerals are continually extracted out of the ground to build (and rebuild) London. Bricks are no longer made locally and facing stone comes from abroad, but where sand, gravel and chalk occur in the London area they are still dug out just as soon as developers can gain access to them. This is typified by the current threat to the old Beddington Sewage Farm — so long a wonderful place for birds — by Thames Water who wish to extract the underlying gravel. Extraction in itself is not necessarily a bad thing for wildlife taken as a whole, but the species are often different after extraction. A sand-pit can provide new nesting sites for sand martins, chalk-pits can provide homes for orchids, and gravel-pits have enormously increased suitable habitats for water birds. But it is not all gain. Fitter's New Naturalist has a plate showing sand martin holes in a sand-pit at South Mimms, but it also shows rubbish dumping. The small area of chalk downland at Harefield in north-west Middlesex has been known since the time of Blackstone in the seventeenth century for its interesting plants including many orchid species, but they were always under threat from the demand for chalk as raw material. The impact of the early chalk-pits was small and they were even eventually colonized by many of the doomed species. As if in revenge for such impertinence they were often covered over with dumped rubble. The last Middlesex early marsh orchid was seen by Kent and Lousley in 1946 just prior to such dumping. The made-up ground with its patches of flowering creeping thistles attracting butterflies is small compensation even when it includes a few painted ladies. Some might argue that where that other raw material, gravel, has been dug out from valley bottoms, notably of the Rivers Lea and Colne, where rubbish dumping does not occur, there has been an overall gain in wildlife. Flooded gravel-pits, and the reservoirs, have greatly increased numbers of wildfowl, gulls and waders visiting and breeding in the London area. A remarkable example has been the little ringed plover. Fifty years ago *London's Natural History* was able to record the first breeding record for the London area in 1944 (only the second time for Britain). Since then they have bred regularly in our area. Another example is that of the heronry at Walthamstow Reservoir which by 1994 was the second largest in Britain with 116 nests. An even more remarkable change in the last fifty years has been the gradual, but relentless, increase in the numbers of cormorants visiting the London area which culminated in the first nesting in 1987 and a now rapidly expanding breeding colony also at Walthamstow Reservoir.

At about the beginning of the twentieth century starlings appear to have started roosting in large numbers in central London. The early history of this behaviour up to 1944 was detailed by Fitter. In 1949 our Ornithological Section began a three-year census and trapping programme to investigate this phenomenon. One notable finding was that the roosting starlings were not wintering Continental birds as had been suggested, but suburban birds using central London as a dormitory — reverse commuting. Whilst preparing this talk in November I visited Trafalgar Square at dusk to see again the massed formations of starlings wheeling around before settling for the night — but there wasn't a starling to be seen anywhere. A few nights later I did manage to locate a small flock roosting in a tree in Leicester Square, but even these had dwindled to a handful roosting on the buildings by December. The ornithological survey had recorded a minimum of 10,000 roosting starlings with many more at some seasons. Has this spectacular ornithological phenomenon ceased without being recorded? I can find no reference to it in the *London Bird Report*. An important event in the history of our Society was the writing by us and publication in

1957, as a Special Volume in the New Naturalist series, of *The birds of the London area since 1900*, which included the results of the starling survey.

Many changes were not specific to London, of course. There has been a marked change in public awareness and attitude to natural history in the last fifty years. When I was a lad trails of dropped bluebells from the local woods at Ruislip were a familiar sight in spring. Now I hardly see a child with even a bunch of buttercups. Boys bird-nesting along hedgerows was still common. Happily this seems to be no longer the case and is generally regarded as unacceptable behaviour. I think there are several contributing factors for this. At the end of the last war there seems to have been a revival of public interest in natural history. I was much encouraged by radio programmes such as 'Nature Parliament', featuring Peter Scott, James Fisher and L. Hugh Newman, but since then television has surely been the main influence on the public perception of wildlife (as of so much else, of course). Overall I feel this has been for the good of natural history as far as the general public is concerned. However, television distorts natural history. Wildlife features on television are served up as spectator events which do not encourage people to get out and see for themselves. But worse is that if they do go out and look for, and at, wildlife they will find the experience quite different from that presented on television, where only the highlights of possibly months of work in the field are shown, with action often unnaturally slowed, particularly bird flight. I wonder how many potential naturalists are disillusioned when they find that natural history does not usually yield up its secrets quite so easily, and give up before discovering the pleasure of being a nature detective.

It is often difficult to decide which drives which — public opinion or legislation, but the series of Acts of Parliament passed in the last fifty years certainly played a large part in focussing attention on wildlife protection. Important were

(a) National Parks and Access to the Countryside Act (1949)
(b) Rivers (Prevention of Pollution) Act (1951, 1961)
(c) Protection of Birds Act (1954–67)
(d) Countryside Act (1968)
(e) Badger Act (1973)
(f) Conservation of Wild Creatures & Wild Plants Act (1975)
(g) Wildlife & Countryside Act (1981)

In particular people in this country have become increasingly aware of protecting the environment. The great smogs of the 1950s stimulated the Clean Air Act (1956, 1964). The subsequent recovery of the lichen flora has been very marked. Ironically one species, *Lecanora conizeoides*, actually did better in the polluted air, apparently because not only could it tolerate high levels of sulphur dioxide, but it also benefited from the lack of competition from other less-tolerant species. Does this pose a conservation problem? There is a downside to every so-called improvement in life. Airborne sulphur dioxide used to keep roses free from back spot *Diplocarpon rosae*. Now gardeners have yet another problem to deal with.

In the last hundred years there have been several attempts to reduce the pollution in the Thames, but the really effective clean-up started in the late 1950s and had a remarkably rapid effect on fishes. This was studied by Mr Alwyne Wheeler of the Natural History Museum and also LNHS recorder for fishes at that time. In particular by examining the intake water-filters of the power stations along the Thames he found that a large number of fish species gradually moved into central London. Water and wetland birds also quickly reappeared. The pattern of this was interesting and vividly illustrated the interdependence between things. Large numbers of ducks fed along the shores on *Tubifex*, a red worm which thrives in semi-polluted water. At its peak the shores were coloured red by the worms. Downstream from London the Thames recovery began in the estuary, due to the diluting effect of the great volume of sea water, and then gradually moved upstream. When conditions downstream became too clean for the *Tubifex* they started moving upstream to where the river was still semi-polluted, and the ducks followed. Eventually everywhere was so clean that the *Tubifex* population more or less disappeared — and so did the ducks. There is a moral here: you can have things too clean for the general good of wildlife.

Mute swans decreased dramatically during the 1950s and 1960s. This was attributed to lead poisoning from lead weight shot used by anglers, and it has to be said that the general increase in swans since then has coincided with the ban on the use of shot. But in the London stretch of the Thames, where once herds of more than a hundred could sometimes be seen, they have not returned. This is almost certainly due to the present absence of food from spillage during the working of the grain and rubbish barges which ceased in the 1950s. Another moral here, I fancy! In a similar vein within the last fifty years has been the fall and rise of the sparrowhawk population in London, as in other areas, correlated with the use and then banning of organochlorine insecticides. The case looks strong — overwhelming some would say — but we have to be very cautious not to jump to hasty conclusions in natural history, with its usually complex situations. Natural history is largely an observational science (more like astronomy than physics) and it would be tempting, for instance, to assume that the increase in nesting hobbies in the London area in recent years was also due to the banning of organochlorine insecticides. The feeding habits of the hobby do not support this, however, and its remarkable increase from zero in 1982 to ten proved breeding pairs (34 pairs present) in 1983 in the London area remains something of an enigma. An even more remarkable success story has been the commencement and continuing increase in breeding common terns. Fifty years ago they occurred in our area only as birds of passage like such other species as arctic and black terns. In 1963 a pair nested at a gravel-pit in the Lea Valley. By 1993 there were at least 145 pairs nesting at fourteen sites. Why did this occur? Although reasons can be suggested the plain fact is that we don't know. Breeding common terns is a success story that still continues. In contrast, black-headed gulls started breeding at Perry Oaks Sewage Farm in the 1940s and in 1961 six pairs also bred in the Colne Valley at Maple Cross Sewage Farm. By 1965 breeding in the London area had ceased. Why? Again we don't know. Species, not just bird species, have their ups and downs and in few cases is it really known why. Usually it is the downs that give us most concern. We mourn the loss of woodlarks and red-backed shrikes, the high brown fritillary butterfly and the corn-cockle, but biologically the gains are probably more significant than the losses and yet they are often viewed with apprehension. The coming of the collared doves, breeding cormorants, and the water plant *Crassula helmsii* are not viewed by all with favour, and the biological marvel of the increase of Canada geese and ruddy ducks could be a positive menace to other species. The natural world is a complex web with many interactions. Think of the ramifications deriving from the increase of the elm-bark beetle, or was it the fungus that it carried? Between them they produced the epidemic of Dutch elm disease which in the 1970s wiped out all our large elms. Their loss certainly made us belatedly appreciate and study elms. Only the more obvious consequences of the disease are known, such as rooks often having to nest in tree species unusual for them, the decrease in the white-letter hairstreak butterfly whose larvae feed on elm, and the increase in the previously uncommon toadstool *Rhodatus palmatus* on the huge amount of dead elm wood.

For those whose memories do not stretch back to the 1950s it is hard to appreciate the effect on much of the countryside then from the vast number of rabbits before the introduction of myxomatosis. Their decrease, coupled with a decline in grazing, has altered the floral composition of most of our open grasslands, particularly the Downs. The decline in the amount of hedgerows has been much lamented in the last fifty years. This has also stimulated a lot of interest and research in them. One tentative finding by Dr Max Hooper was that, on average, the number of species in a thirty-yard stretch of hedge increased by one species every hundred years. This became famous as 'Hooper's Hypothesis' (Pollard et al. 1974). It isn't true of course, but it did make a lot of us look very closely at hedges. Another fashionable interest of the last twenty years has been ancient woodlands, largely stimulated by the books and works of Oliver Rackham. This has resulted in the study of so-called indicator species, coppicing and so on, but perhaps to the neglect of more recent plantations and secondary woods. It is generally assumed that the latter are poorer in species and less important for wildlife — but are they?

Our Society published its second book in 1977, an *Atlas of the breeding birds of the London area*. Other books have followed: *Flora of the London area* (1983), *The butterflies of the London area* (1987), *Larger moths of the London area* (1993) and most recently *Bird-watching in London* by Max Nicholson (1995). London's natural history continues to be published in our journals, *The London Naturalist* and the *London Bird Report*. Coloured plates of a quality that would have left those early New Naturalists green with envy are now a regular feature of them. Even rare birds visiting our area being photographically recorded in colour, starting with a desert wheatear in 1989.

London's natural history during the last fifty years has seen interesting changes and an improved public attitude to wildlife and its conservation. Who knows what changes the next fifty years will bring? Perhaps the recent records of peregrine falcons in the City and red kites (not yet in the City as they were until the eighteenth century, but certainly within our recording area), and the arrival of Danish scurvy grass along salt-scattered roads are indicative of things to come. Our Society has played a major role in recording and fostering interest in London's wildlife during the period and must continue to do so in the future. As an independent organization without paid staff we are not subject to the vagaries of funding bodies and we are, I hope, well prepared for the next fifty years.

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# Hampstead Heath Survey

At its meeting on 17 October 1995, Council asked the President to look for a possible research site north of the Thames to complement the Society's long-running Bookham Common Survey. This arose out of a suggestion from the A & F Committee. They noted that Hampstead Heath was an obvious possibility.

The President contacted the Superintendent of Hampstead Heath, Mr Paul Canneaux, who was extraordinarily supportive of such a survey and offered the LNHS the use of a refurbished room in a small brick building on the Heath Extension. The key was handed over on 11 June and our new Survey Centre viewed by members during a botany field meeting led by David Bevan a few days later.

The President agreed to Council's request that he should organize the setting up of the survey. Ten members attended a meeting at the Centre on 4 July 1996 when the following agreed to join the Survey Committee:

Colin Bowlt, Chairman
Jeremy Wright, Secretary
Barbara Villiers
David Bevan
Dan Hackett
Tim Neal
Ray Softly

It was agreed that the regular meetings, at least initially, should be on the last Saturday of the month. A research programme was discussed and it is hoped that some of the studies will parallel those at Bookham for comparison.

# Possible thermokarst landforms near Theydon Bois, Essex

S. BOREHAM

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## Summary

The morphology and geology of flat-bottomed embayments near Theydon Bois, Essex, are described. Similar features in Siberia and Canada formed by contemporary periglacial backwearing processes (thermokarst) are outlined. In addition, flat-bottomed embayments from the southern Fenland of East Anglia, attributed to thermokarst activity, are also noted. The embayments around Theydon Bois are interpreted as the product of thermokarst activity which operated under periglacial conditions during the Devensian (last cold stage), and possibly other cold stages since the Anglian.

## Introduction

The village of Theydon Bois is situated two kilometres south-east of the Epping Forest ridge and two kilometres north-west of the River Roding, in south-west Essex (TQ 450990). The landscape around Theydon Bois is dominated by a number of flat-bottomed embayments at 45–55 m O.D. (Ordnance Datum) surrounded by rounded hills reaching *c.*75 m O.D. (Figure 1). The floors of the embayments show typical slope angles of *c.*1°, whereas the surrounding slopes are often 8–12°. The area is underlain by London Clay bedrock, although the surrounding hills are capped by till (boulder clay) of Anglian age. To the north-west, the London Clay is overlain by Claygate Beds, other younger Tertiary strata, and Pleistocene Pebble Gravel which together constitute the Epping Forest ridge rising to 115 m O.D. To the south-east, the Roding valley (20–25 m O.D.) contains a series of Pleistocene fluviatile gravel terraces, and Flandrian (Holocene) alluvium. The flat-bottomed embayments are cut into London Clay and are distinct from the past courses of the River Roding, indicated by the gravel terraces.

This article details the morphology and geology of the flat-bottomed embayments around Theydon Bois, describes contemporary periglacial backwearing processes and ascribes the formation of these embayments to thermokarst activity during the Devensian (last cold stage), and possibly other cold stages since the Anglian.

## Periglacial backwearing processes

During the middle and late Devensian, southern Britain was affected by permafrost (permanently frozen ground) under periglacial conditions, where freezing and thawing were the dominant surface processes. These conditions were probably similar to those found in Siberia and Canada today. In these circumstances, surface water from springs and melting ground ice may accumulate to form ponds or thaw lakes. Consequently, a number of periglacial backwearing processes begin to operate. The thermal and mechanical energy of water leads to thermo-abrasion, whilst the action of solar radiation and thermal energy of the air on slopes at the edge of a pond is termed thermo-denudation. Lastly, the thawing of ice-rich sediment is known as thermokarst (cf. West 1991). These erosional processes may enlarge a thaw lake rapidly, and by a considerable amount to form a roughly circular depression, often with a narrow outflow channel draining through a col, similar to the thermo-cirques described from Siberia by Czudek and Demek (1970). The speed of backwearing can be demonstrated by the slope recession of up to 10 m a year which has been

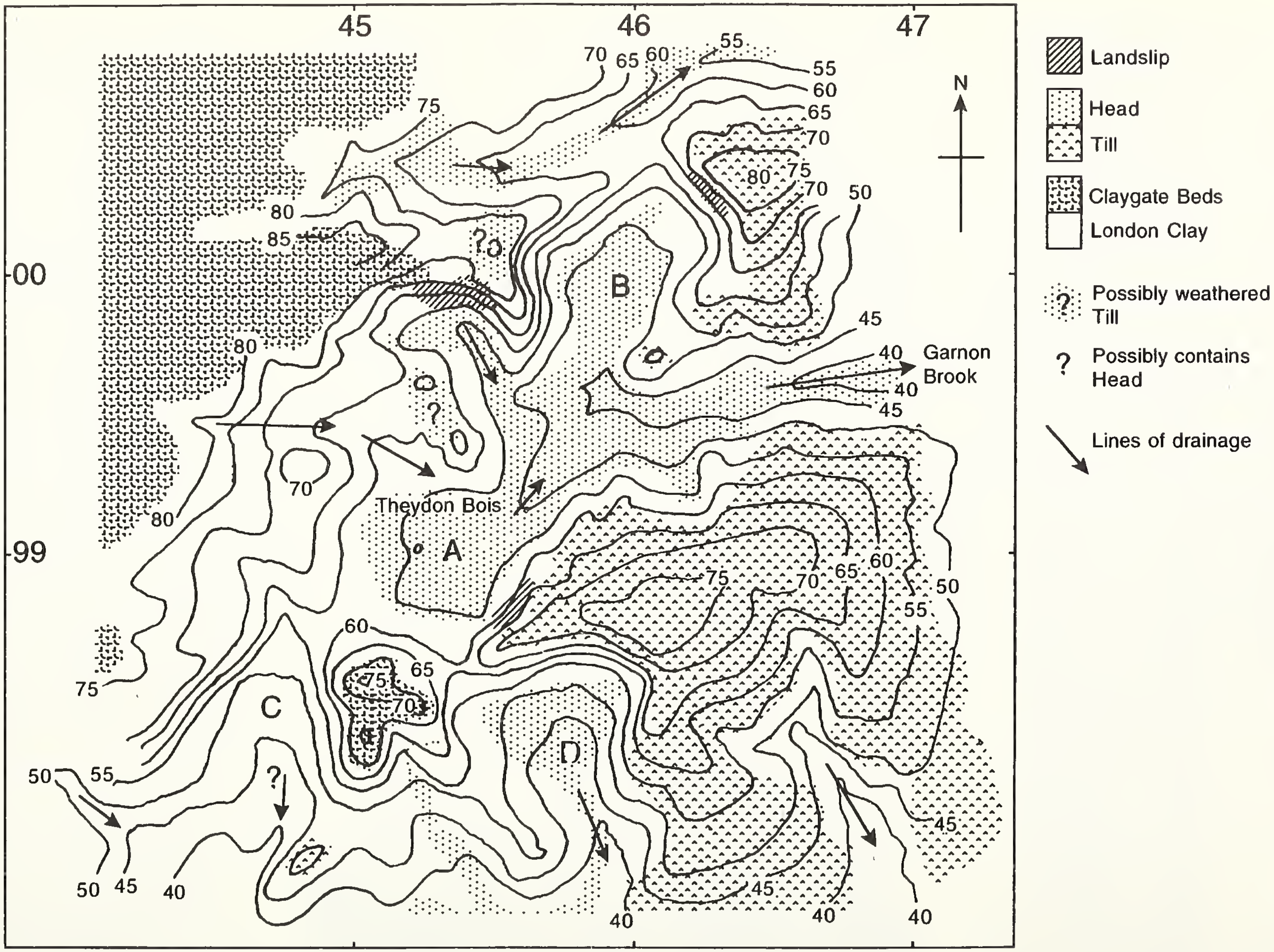

FIGURE 1. Map of the area around Theydon Bois showing the geology and contours at 5-metre intervals. Geology reproduced by permission of the Director, British Geological Survey, NERC copyright reserved. Contours reproduced from Ordnance Survey maps with the permission of the Controller of Her Majesty's Stationery Office, © Crown copyright.

reported from Siberian reservoirs (Are 1979, Are, Balobayev and Bosikov 1979). The continuation of backwearing eventually leads to the formation of a large flat-bottomed embayment. Embayments containing thaw lakes have been recorded from Alaska by Chapman, Detterman and Mangus (1964) and West (1991), and from Canada (Harry and French 1983).

West (1991) demonstrated the development of Devensian thermokarst embayments on Jurassic clays in southern Fenland, and described a sequence of stages in the evolution of thermokarst features, culminating with two or more flat-bottomed embayments coalescing to form a large channel. West also noted that at latitudes more southerly than the Arctic examples we observe today, there would be a higher summer heat gain which could cause even greater erosion through thermokarst and similar processes. These effects would be especially severe on bedrock types which have a high water content such as the London Clay, particularly where it was unprotected by overlying sediment, such as till or gravel. Many of the Fenland embayments contain a deposit comprising grey silty clay, sometimes with sand or pebbles, known as the Crowland Bed (Booth 1982, Gozzard 1982). This deposit is derived from solifluction associated with backwearing of the embayments and overlies bedrock or Devensian gravels, but is overlain by the earliest Flandrian peat. The last episode of backwearing in these features can therefore be dated to the late Devensian.

## Observations

Figure 1 shows the location of the flat-bottomed embayments in the vicinity of Theydon Bois. Features A and B together form a depression approximately 2 km long, aligned NNE–SSW at 50–55 m O.D. In contrast, features C and D are at a lower elevation (45–50 m O.D.) and are somewhat smaller (*c.*0.5 km diameter). There are cols at *c.*60 m O.D. connecting features C and D with feature A and connecting feature B with a small valley to the north. Features A and B are drained by the narrow eastward-flowing valley of Garnon Brook. This stream and its tributaries rise on the eastern slopes of the Epping Forest ridge. Features C and D are drained by much smaller southward-flowing streams. In the field, there are constrictions at the outlets of these features, which do not show clearly from the 5 m contour interval available on the Ordnance Survey maps. There is often a sharp break in slope where the flat embayment floor meets the steep sides. It should be noted however, that many other stream valleys in the area are clearly incised, and do not contain flat-bottomed embayments.

The study area falls on the boundary of two British Geological Survey (BGS) maps; Sheet 257 Romford, and Sheet 240 Epping. The Epping Sheet was most recently published in 1981, and the Romford Sheet was last published in 1976 and is currently in the process of revision. The geological maps show a discontinuous mantle of till overlying London Clay bedrock (Figure 1). It appears that in general the embayments have been cut into the western edge of the till and into the south-east edge of the Epping Forest ridge. In addition, a deposit termed head has been mapped on the floors of the embayments. The Outline of Geology from the Epping Sheet (Millward 1981) defines head as 'sandy hillwash and solifluction deposits covering the bottoms of many valleys and depressions. The deposits consist of up to 7 m of structureless loamy clays, silts and sands with angular flints, commonly locally derived.' The Epping Sheet Memoir 240 (Millward et al. 1987) describes features A and B, 'The wide valley [459 995] between the London Transport railway line and the motorway east of Theydon Bois', as being 'floored by ochreous and reddish brown sandy clay with small, but varying amounts of angular flints'. Such head deposits appear to be closely similar to the Crowland Bed (see above) in both lithological description and probable genesis. There is also head mapped capping some of the hills to the west of feature B, although previous editions of the geological maps for this area showed till at these locations. Therefore, it is possible that this material may be *in situ* or soliflucted decalcified till. In addition, some of the steeper slopes to the north of feature B have been mapped as landslips.

## Discussion and conclusions

The geological situation of the embayments suggests that they may have been formed by the same processes which operate in Arctic thaw lakes today. It appears that these thermokarst features have formed between the Epping Forest ridge and the edge of a mantle of Anglian till. Indeed, it is possible that minor spring lines associated with the boundary of the till and underlying London Clay may have been a significant factor affecting development of the embayments. A large component of the head described from the floors of the embayments is probably the product of solifluction associated with backwearing by thermokarst activity at the edge of the thaw lakes. Although features C and D are discrete, the elongated channel created by the union of features A and B may represent an advanced stage in the evolution of this thermokarst system (West 1991). Unlike the embayments of southern Fenland, those around Theydon Bois do not appear to contain Devensian gravels or Flandrian deposits such as peat. This means that the last episode of backwearing cannot be dated easily, although it is likely to have been in the late Devensian. However, it is possible that these features are not solely the product of Devensian periglacial conditions, but may be more ancient, having their origin in cold stages as early as the Anglian.

It appears that at the maximum of the Anglian glaciation, an ice sheet partially overtopped the Epping Forest ridge and moved south to occupy a valley in the present position of the River Roding. In the late Anglian, the receding ice sheet left a till mantle overlying London Clay immediately adjacent to the Epping Forest ridge. The till probably had an uneven surface, with kettle holes and disrupted drainage. It is easy to envisage thaw lakes, possibly fed by streams from the Epping Forest nunatak, forming at the edge, and across the surface of the till mantle. Such thaw lakes would have been extremely susceptible to backwearing and enlargement through thermokarst activity due to periglacial conditions at the end of the Anglian. It seems likely that these depressions would have been reactivated in subsequent cold stages, culminating with the Devensian. Therefore, the embayments around Theydon Bois may be ancient thermokarst features which have a polycyclic origin. It is likely that there are similar landforms elsewhere in the London area on London Clay, especially where it is confined by overlying till or Pleistocene gravels, or changes in bedrock lithology.

## Acknowledgement

The author would like to express sincere thanks to Prof. R. G. West for the invaluable discussions, help and encouragement received during the gestation of this project.

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# Book review

***Systematics and evolution of* Littorina.** David G. Reid. The Ray Society, London. 1996. 463 pp., A4. £89. ISBN 0 903874 26 1.

This latest volume, which weighs in at a formidable 6 lbs, is publication 164 of The Ray Society, and it continues the highly respected natural history series initiated a century and a half ago.

The marine snails of the genus *Littorina* are the familiar periwinkles found on the rocky shores of western Europe, North America, Siberia and Japan. Since they are common and accessible they are amongst the most intensively studied of all marine invertebrates. Nevertheless, new discoveries over the last three decades have revolutionized our knowledge of these animals.

The book opens with a delightful full-page colour frontispiece of periwinkles amongst barnacles on the shore of Alaska, and later there is a colour plate showing variation within populations of *Littorina,* whilst also within the text are 63 black-and-white plates of shells and radulae, 24 pages of anatomical drawings and 19 distribution maps. Following the short introduction, the bulk of the work is divided into chapters on material and methods, morphology, systematics (19 living and 10 fossil species), phylogeny, and macroevolutionary history, and there are almost 1,500 references in the bibliography.

Due to the extreme intraspecific variability in the form and coloration of their shells, there is much taxonomic controversy surrounding *Littorina* species which means they are excellent subjects for the study of microevolution and natural selection. This is the first account of variation throughout the genus and the bewildering diversity of shells is resolved into repeated patterns of geographic, ecotypic, ontogenetic, sexual and colour variation. Using information from the cladistic analysis of morphological characters, from the fossil record, and from published work on allozyme frequencies and DNA sequences, a detailed species-level phylogeny has been reconstructed. In combination with distributional data, this is used to discuss speciation mechanisms and historical biogeography. Although dominant on shores of the northern Atlantic Ocean today, the genus only invaded from the Pacific during the late Pliocene when it took part in the trans-Arctic biotic interchange.

This is a remarkable piece of work which will be of interest not only to malacologists (and conchologists), but also to those concerned with the evolution and biogeography of marine invertebrates in general.

K. H. Hyatt

# The Woolwich Beds and the London Clay of Newhaven (East Sussex): new palynological and stratigraphical data

C. DUPUIS and C. GRUAS-CAVAGNETTO

**Translated from the original in the *Bulletin d'Information des Géologues du Bassin de Paris* 22 (2): 19–33 (1985) by MORRIS ANSELL**

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## Editorial notes

The purpose of this translation from the French is to bring work to a wider audience on an important British Palaeogene section and Site of Special Scientific Interest (SSSI), and to facilitate cross-Channel studies. The text, table and illustration captions have been translated without correction, Newhaven is said to be in the Hampshire Basin, although commonly considered to be part of the Wealden Basin; 'Websterite' = Aluminite; '*Cyrena*' = *Corbicula*; and the White Chalk is in the *Gonioteuthis quadrata* and *Offaster pilula* zones, not *Marsupites* zone (Prof. R. Mortimore, pers. comm.). Also, the Woolwich Beds are now the Woolwich Formation, and Londinian is not an accepted chronostratigraphical term. However, in some places the language has been tightened up.

Additions to the Tertiary bibliography of this section, omitted by Dupuis and Gruas-Cavagnetto, or published subsequently, are given on p. 38. (Informal accounts are indicated by an asterisk). Cyprideid ostracods occur in the shelly clays and could help identify brackish incursions (Dr E. Robinson, pers. comm.).

Corrigenda: a cross should be inserted against the following species in the list of fossils (C. Dupuis, written comm.):

Pollen:

*Intratriporopollenites ollivierae*
*Spinizonocolpites echinatus*
*Tricolporopollenites cognitus*

Dinophyceae:

*Keleyia* aff. *pachycerata*
*Wetzeliella astra*

See Dupuis and Gruas-Cavagnetto, 1985: 31–32 for species list of spores and pollen, and *loc. cit.*: 32–33 for Dinophyceae, Acritarcha and Chlorophyta: + = species of stratigraphical value.

For original English Abstract, see Dupuis and Gruas-Cavagnetto, 1985: 19.

This project was undertaken with the permission of the authors and the editor of the *Bulletin.*

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## [Introduction]

The Tertiary deposit at Newhaven, in the south of the South Downs, is the only outcrop of the Woolwich Beds in the Hampshire Basin [*sic*]. It is also the only significant outlier of London Clay, providing evidence of the former extension of the Ypresian formations over the whole of the London Basin, Hampshire, the Belgian Basin and the northwestern part of the Paris Basin (Figure 1).

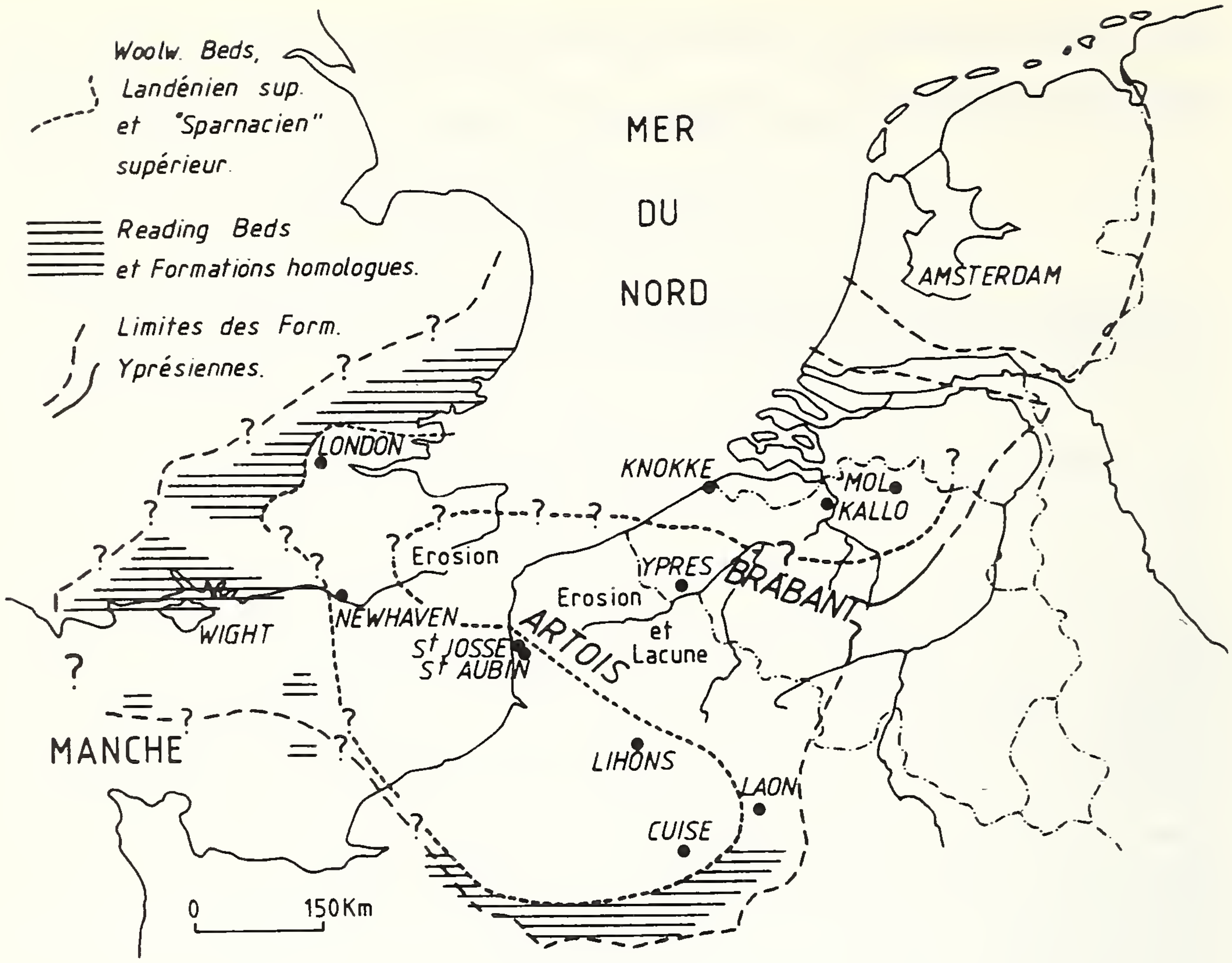

FIGURE 1. Location of the Newhaven Tertiary outlier at the junction of the southern North Sea Basin and the Dieppe–Hampshire and Paris Basins. The palaeogeography is at the end of the Palaeocene and the beginning of the 'Ypresian' transgression (after Dupuis et al. 1982, 1984, Feugueur 1963, and Hester 1965).

The interest of this deposit had not escaped early British authors keen to establish correlations with the Paris Basin, especially with Normandy (Webster 1814, Buckland 1817, Mantell 1822, Prestwich 1854, Whitaker 1871).

Mentioned sporadically in more recent works (for example Hester 1965, Destombes et al. 1977) it does not appear to our knowledge to have been the subject of a study later than that of Whitaker which remains the most comprehensive.

The present paper provides an up-to-date description of the Tertiary deposit at Newhaven as well as a palynological analysis enabling a stratigraphical comparison with neighbouring regions.

## I. The Newhaven Tertiary deposit

In the nineteenth century, the chalk cliffs to the west of Newhaven (Castle Hill), which are still there, made access dangerous to the lower part of the overlying Tertiary (Woolwich Marine Beds and Freshwater Beds, Figure 2). However, it was apparently easy to observe the upper two-thirds (above the peaty beds, Figure 2).

At present the situation is reversed. As a result of port development works, the cliff is stabilized by shingle bars which conceal the base. The upper clay section of the Woolwich Beds is turfed and is poorly exposed in a few landslips. On the other hand, the lower sandy section has become readily observable thanks to some scree slopes.

The following lithological description is therefore concerned mainly with the lower sands. One can distinguish glauconitic sands with pedogenic tops (Figure

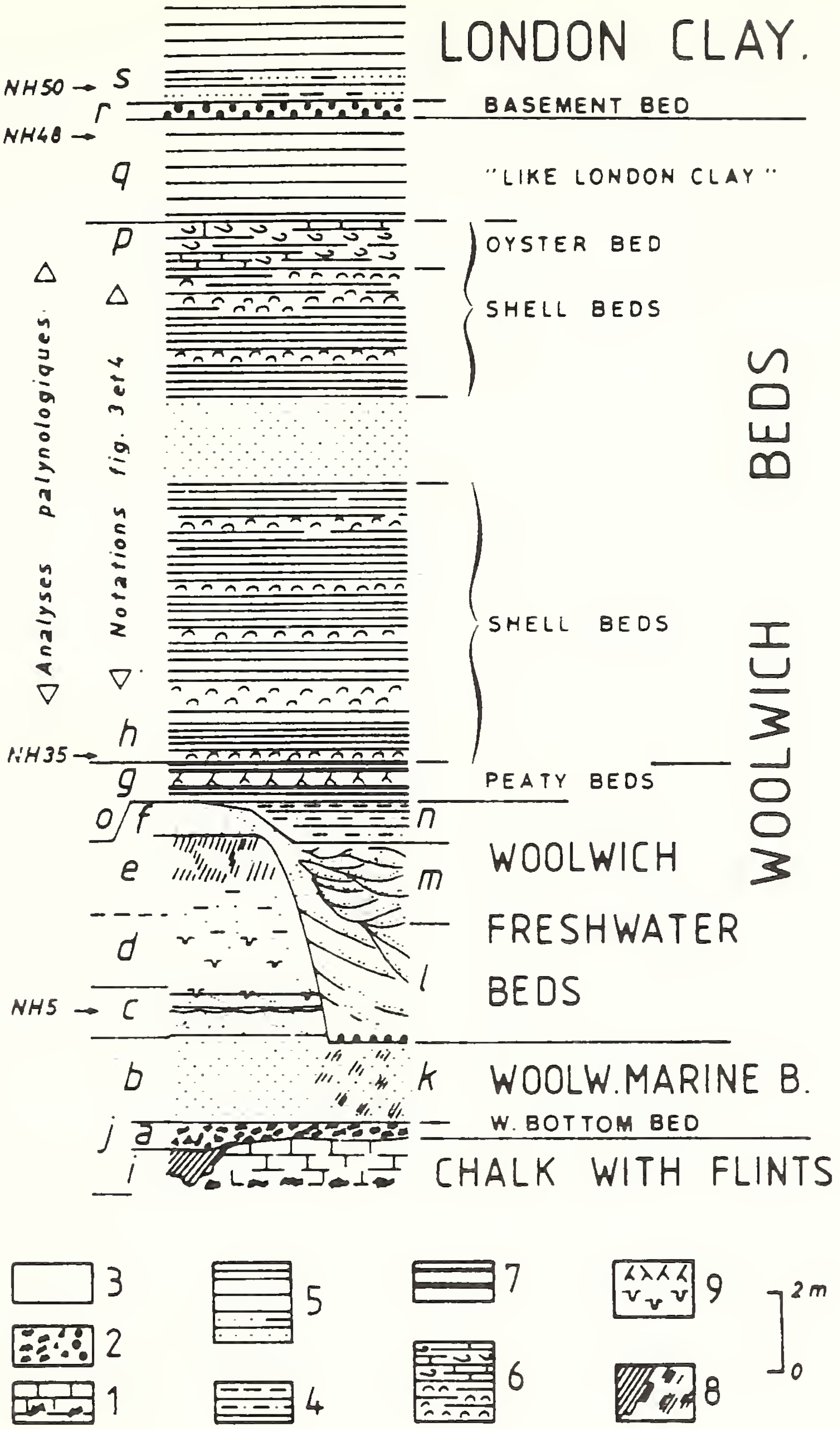

FIGURE 2. The Newhaven succession: composite section and lithostratigraphical names used (based on Whitaker 1871, Hester 1965, and the *Lexique Stratigraphique International*). For the location of palynological samples and notations see detailed sections in Figures 3 and 4.
Key: 1 flinty chalk, 2 flint nodules, gravel and pebbles, 3 various sands, 4 more or less clayey or sandy silts, 5 clays and silts, occasionally sandy, 6 limestone with oysters and *'Cyrena'* beds, 7 lignite, 8 solution deposits in potholes and ferruginous indurations, 9 traces of roots and bioturbation. The scale is approximate.

3, C1, C2 and C3 part) and fluvial sands and silts in channels (Figure 3, B2 part and B3). We correlate the former with the Woolwich Marine Beds; the latter represent the Woolwich Freshwater Beds.

Above this comes peaty clay — the peaty beds — then Cyrena Clay (Figure 3, B4 and C3 part) of Sparnacian facies. Towards the top of the hill, it has been

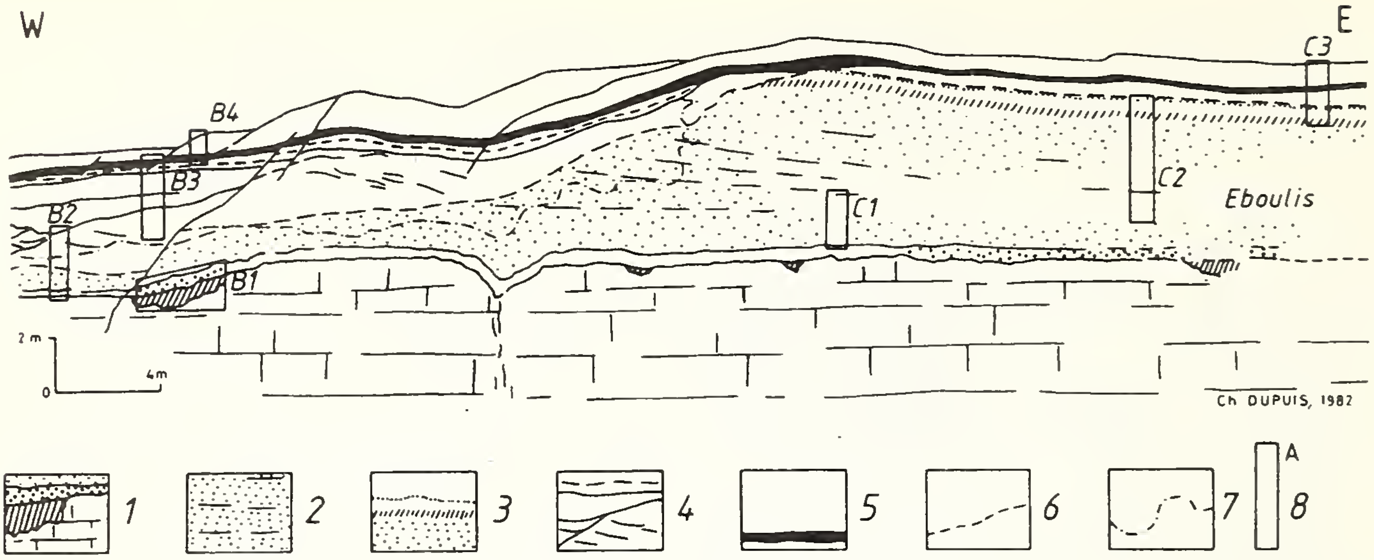

FIGURE 3. Aspect of part of the cliffs to the west of Newhaven showing the solution deposits on the chalk beneath the Woolwich Bottom Bed (1), the Woolwich Marine Beds (2) with pedogenic top (3), the base of the fluvial deposits (6) with sands and silts (4) filling a channel towards the west, the 'peaty beds' starting with a thick peat horizon and the limit of the localized indurations in and under the channel (7). The principal detailed surveys used to draw the sections B and C of Figure 4 (8) are located. Based on slides and sketches of the section.

possible to study only the contact of the London Clay with the Woolwich Beds (Figure 4 A).

In addition, beneath the glauconitic sands, a few solution pipes enter the top of the flinty chalk (*Marsupites* zone, Barrois (1878)).

**A. The solution deposits predating the Woolwich Beds** (Figures 3 and 4)

The Tertiary formations commence with a conglomerate of green [glauconite]-coated flint nodules. Beneath this, the solution deposits are preserved in a few shallow pipes [i]. The largest of these contains clay of grey/green and dark brown colour mottled with large white patches of gibbsite, more or less powdery. Webster (1814) seems to be the first to have noted this mineral, associated with a subsulphate of alumina ['websterite'] which has not been found in the course of our study (Buckland 1817, Mantell 1822). Above the pipe, the conglomerate is thickened considerably with a sandy intercalation which implies that the solution deposits are older, at least in part.

**B. The glauconitic sands and their pedogenic top** (Figure 4, section C).

1. Brief description

Above the conglomerate (a) can be seen from bottom to top:

(b) glauconitic sands, a little clayey especially at base, bioturbated with fine green-coated flint gravel;
(c) glauconitic sands, very slightly clayey, yellowish, with cross stratification often of herringbone type. There is a little bioturbation which is more frequent towards the top and a layer of grey, clay-draped ripple marks;
(d) glauconitic sands, fairly clayey and strongly bioturbated with some green-coated flint gravel at top;
(e) glauconitic sands, grey/green/yellow, clayey, with pockets at top of gritty, yellowish, non-clayey sand enclosed in black-brown or rusty-brown ferruginous rings. A few traces of blackish roots;
(f) sands of grey or purplish-grey colour; not clayey, and peaty at contact with overlying peat; small root traces.

The sands are generally felspathic and impregnated with jarosite.

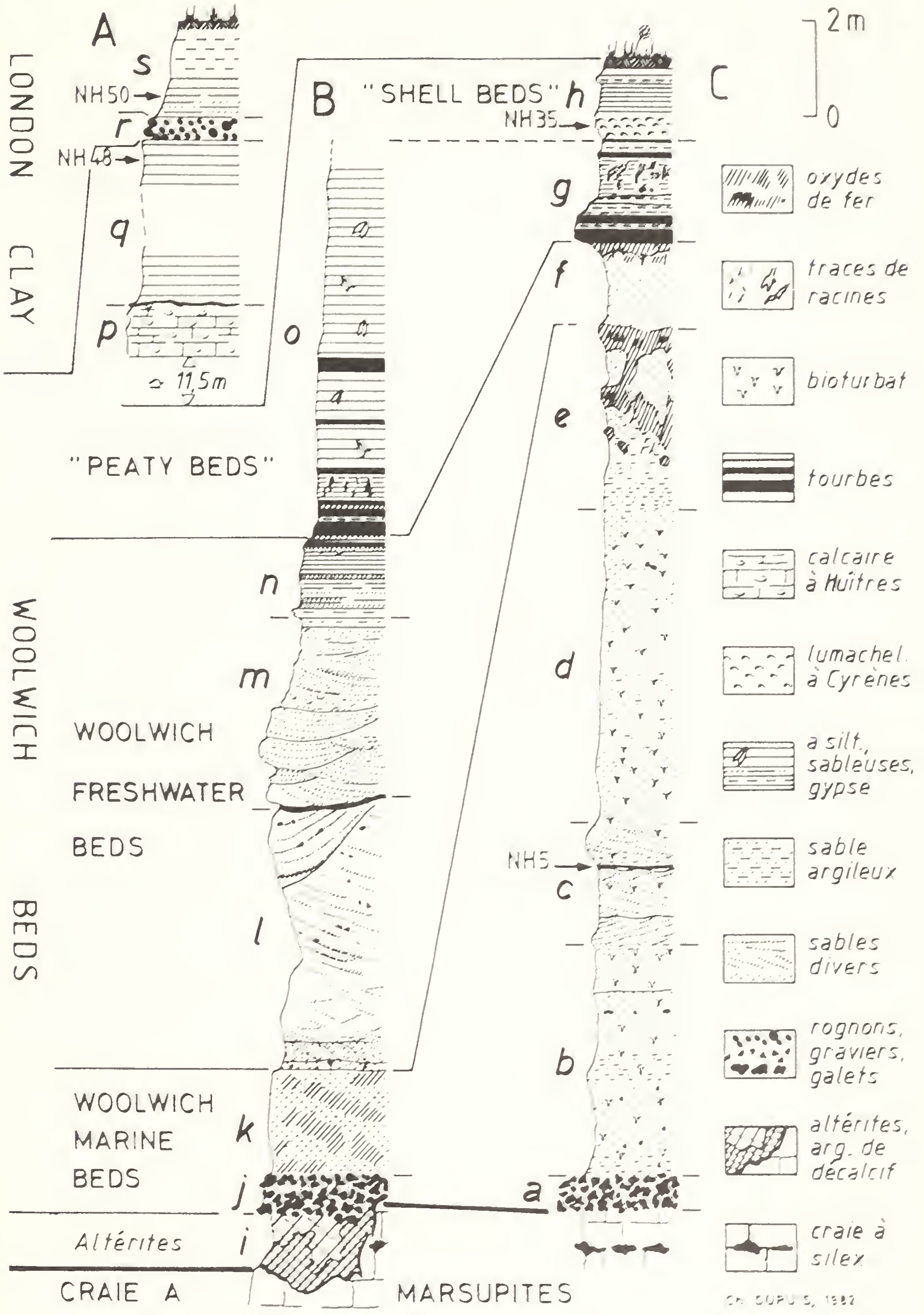

FIGURE 4. Composite sections of the outcropping part of the Newhaven Tertiary.

2. Comments and interpretation.

Beds (b) to (e) record, from bottom to top, a progressive increase of the median [grain size] (220 to 340 microns) identifying a negative regressive sequence. The coastal character is confirmed as much by the sedimentary structures as by the presence of numerous burrows of *Callianassa*.

The progradation resulting in the build-up of facies that became progressively shallower ends in emergence with the deposition of a soil on top of the sands (e).

Two principal pedological phenomena are further superimposed in the following order: first, a leaching of fine particles (the upper, leached part of (e) contains only 3 per cent of particles smaller than 50 microns as opposed to 19 per cent in the lower part); second, the formation of the ferruginous structures.

The palaeosol is sealed by bed (f) equivalent to the fluvial sands and silts of the channel (units (l), (m), (n) Figure 4, section B) to which it corresponds spatially (Figures 3 and 4). This equivalence is also supported by the presence in (f) and (n) of a granulometric secondary mode of 145 microns characteristic of the top of the fluvial sands. Moreover, the same units contain grains of pink quartz which is absent from the marine sands. The development of jarosite exposed in (f) is clearly later than the palaeosol.

Comparable negative sequences, traditionally assigned to the Thanetian, are known from the Paris Basin (Lihons, Criel: Dupuis *in* Robaszynski et al. 1982; Reims: Laurain et al. 1984).

### C. The fluvial sands and silts of section B (Figure 4).

1. Brief description

Above the conglomerate of green-coated flint nodules (j) and a metre of altered glauconitic sands, stained with iron oxide and jarosite (k), can be observed from bottom to top:

(l) yellow or grey felspathic sands, slightly indurated and gravelly towards the top, filling a hollow in the subjacent glauconitic sands. Grains of pink quartz present. Small-scale cross-bedding developed passing into sub-parallel bedding towards the top. The unit comprises several 1–10 m channel fills with cross bedding trending E–W;

(m) yellow sands, a little felspathic and unevenly indurated, cutting into the subjacent unit. Grains of pink quartz and trough-fill cross stratification on decimetre to metre scale present. Gradual appearance of clay clasts towards the top;

(n) more or less silty clays, grey or grey/brown in colour. Limited sandy beds developed. Numerous lignified plant remains and small cracks and root traces filled with jarosite present.

The induration of sediment, partly due to jarosite, mainly affects the channel fill but also the subjacent sands.

2. Comments and interpretation

The units (l), (m), (n) comprise a positive [depositional] sequence. The succession of large-scale, oblique cross-stratification (l), small-scale, trough-fill cross-stratification (m) and fine, horizontally-laminated sediments (n) is comparable with braided-river sedimentation. The width, shallow depth and frequency of fluvial channels at the top of the marine sands support this interpretation.

The principal channel studied has a width of about 160 m and depth of 6 m; at least three other channels can be observed in some 2 km of cliff line.

**D. The 'peaty beds'** (Figure 4, sections B and C)

The top of section C extends to the base of the shell beds (h) — grey clays with '*Cyrena*'. The 'peaty beds' (g), (o) are alternations of grey clay and peaty layers and show root traces towards their base.

The beds thicken laterally to fill up a residual depression aligned with the channel (section B). Jarosite in small veins and gypsum in rosettes and prisms are common.

The appearance of peat beds is associated with a widespread uniformity of facies. The beds are either alluvial plain deposits following regression, or coastal marsh sediments due to a rise in sea level. In any case, the succeeding peaty beds indicate consecutive stages of aggradation due to a rise in sea level from the base up to root traces in (o) and (g). This soon led to the local disappearance of peat and the transgression of lagoonal facies with '*Cyrena*' and oysters.

**Note:** the transgressions being essentially diachronous, we shall subsequently use the name 'Londinian' to avoid the ambiguities of the common term 'Ypresian', a chronostratigraphic unit.

These peaty facies are very similar to the clays and sands with molluscs and ostracods of the Sparnacian facies of the Normandy–Picardy coastline (Dupuis *in* Robaszynski et al. 1982).

Jarosite is known to form especially in mangrove soils (Viellefon 1974, Meyer and Laurain 1978). From first impressions, such an explanation could be envisaged here and the neogenesis of jarosite would then depend on possible soils developed beneath and in the 'peaty beds'. However, the absence of a developed soil profile, the absence of palynological mangrove indicators (II, A, sample NH35) and finally, the presence of jarosite above the last peaty bed contravene this explanation. Rather, the deposition of jarosite resulted from the percolation of acidic sulphate solutions produced by changes in the state of sulphur in the clays and peats above. The gibbsite of the solution deposits would have resulted from the precipitation, in a less acidic medium, of the aluminium compounds leached from overlying beds (Dubreuilh et al. 1984).

**E. The contact of the London Clay and the Woolwich Beds** (Figure 4, section A).

The top of the Woolwich Beds consists of a few metres of dark grey clay (q), resting on limestones with oysters ('oyster bed' (p)) which are also a characteristic element of Sparnacian facies.

Only the very base of the London Clay (approximately one metre thick and sandy for about twenty centimetres) is visible at the top of Castle Hill (s). The junction is indicated clearly by about thirty centimetres of pebbly Basement Bed (r). The whole of the London Clay is included in the zone of superficial decalcification which extends down to the top of the limestones with oysters (p) at which point there is a layer of brown clay, the result of decalcification. The absence of molluscan shells in the decalcified part of the Woolwich Beds (q) accounts for unusual facies described as 'like London Clay' and noted by earlier authors (Prestwich 1854, Whitaker 1871).

## II. Palynological data

[Plates 1, 2 and 3 are not included in this translation, neither is the list of species in the appendix]

Four samples in the Newhaven section were found to be fossil bearing (Figures 2 and 4): NH5 in the Woolwich Marine Beds, NH35 at the base of the shell beds, NH48 at the top of the Woolwich Beds beneath the Basement Bed, and NH50 at the base of the London Clay.

## A. Results

### 1. The Woolwich Marine Beds—NH5

The sample contained few fossils. The most abundant forms are fairly varied tricolporate pollen (24 per cent) and *Plicapollis pseudoexcelsus* (19 per cent), whereas *Platycarya* pollen is represented by only 6 per cent. Amongst the limited species at this level, *Plicapollis* cf. *conserta* PF., which is not found in higher levels at Newhaven, is known from the Landenian of Epinois and Looksbergen in Belgium. The composition of NH5 is fairly similar to that of the shell beds in NH35.

### 2. The base of the shell beds—NH35

The palynoflora is very rich (about 120 species), with an abundant but not very varied microplankton (16 species). The sporopollen association consists basically of pollen of *Platycarya* (25 per cent), *Plicapollis pseudoexcelsus* (12 per cent) and tricolporates (12 per cent). Amongst the latter, the *cingulum* group, comprising *Castanea, Castanopsis* and *Pasania* is up to 6 per cent. The subtriporates form 89 per cent, sparganiacean pollen 4 per cent, but pteridophyte spores are less numerous. Amongst the subtriporate pollen, the most common form is *S. subporatus* (4 per cent), but *S. constans, S. anulatus* and *S. magnoporatus* are also found.

The plankton consists of 91 per cent *Apectodinium*, of which *A. homomorphum* is the dominant species, followed by *A. parvum* (22 per cent) and *A. quinquelatum* (6 per cent). *A sumissum* is rare. Other species are less than 1 per cent; they are mainly *Diphyes colligerum* and *Homotryblium* sp.

### 3. Top of the Woolwich Beds—NH48

An important change in the microplankton association can be observed here. The plankton becomes more diverse, with about sixty species, due to marine influence in connection with the Londinian transgression. The percentages of the most common species are as follows: [see p. 24 of Dupuis and Gruas-Cavagnetto 1985].

The frequency of *Cosmaphaeridium hispidum* is characteristic of the top of the Landenian deposits at Kallo (De Coninck 1969) beneath the Ypres Clay. At Soissons (Bignot et al. 1981), its abundance is linked with a change in facies and biocenosis at the transition from sandy shell marls to Cyrena and Oyster Clays in a brackish environment, where the highest salinity is estimated at about 20 per cent.

The pollen association, which is very different from the lower levels studied, consists of: [see list p. 26 of Dupuis and Gruas-Cavagnetto 1985].

The abundance of taxodiacean pollen is characteristic of the whole of the London Clay (Gruas-Cavagnetto 1976). In the Paris Basin, it is generally less than 5 per cent. The relative frequency of tricolporate pollen of *T. microhenrici* and tiliacean pollen is also characteristic of the lower part of the London Clay.

### 4. The base of the London Clay—NH50

This horizon contains only the remains of Algae (Chlorophyta) belonging to the morphographic [form] genera *Cymatiosphaera* and *Pterospermella*. Pollen and dinophyceans are absent.

## B. Stratigraphical observations

### 1. The Woolwich Marine Beds—NH5

The Woolwich Marine Beds do not contain any markers found in the Sands of Bracheux in the Paris Basin. On the contrary, their content and type of association (with *Plicapollis pseudoexcelsus, Platycarya* and tricolporate pollen) are fairly similar to those of overlying beds which are nevertheless distinguished by a greater sporopollen abundance and diversity.

2. Base of the shell beds — NH35

The base of the shell beds introduces a brackish facies with *Apectodinium*, typical of the Woolwich Beds, and which differentiates it from the freshwater deposits at St-Valery-sur-Somme and Cap d'Ailly (Gruas-Cavagnetto 1966, 1970, and in Dupuis et al. 1982, Downie et al. 1971). The composition and type of sporopollen association are also those of the Woolwich Beds and the Belgian upper Landenian.

We have found several species of tricolporate pollen described by Krutzsch and Vanhoorne (1977) at Epinois and Looksbergen in Belgium. Subtriporate pollen provides good stratigraphical markers and comprises 8 per cent of the Newhaven assemblage, the most frequent forms being *S. constans, S. subporatus* and *S. anulatus*, and (amongst the caryoid pollen) *C. triangulus* as in the upper Landenian of Belgium (L2).

Amongst the tiliaceans, forms with microreticulate exine predominate (as in L2), and *Intratriporopollenites microinstructus* is present, a species which dies out in the Ypres Clay in Belgium. This species does not continue after the 'lower Sparnacian' in the Paris Basin. From NH35 upwards occur forms similar to *Homotryblium pallidum*? (in De Coninck 1969: pl. 9, figures 19–23, 26, 27).

De Coninck (in Dupuis, De Coninck et al. in press) has also found *Homotryblium* sp. in the Landenian of the Knokke borehole which seems to differ from species known higher up in the Ypres Clay. This observation must be reconciled with that of Costa et al. (1981) who noted the first *H. tenuispinosum* in the zone of *A. hyperacanthum.*

3. Top of the Woolwich Beds — NH48

The top of the Woolwich Beds contains a sporopollen association typical of the London Clay, which is dominated by taxodiacean pollen, indicating the proximity of marshy forest. The microplankton resembles that of the upper Landenian/Ypres Clay boundary. Two markers which appear in the Paris Basin (Gruas-Cavagnetto 1977) and in Brittany (Ollivier-Pierre 1980) in the 'upper Sparnacian' are present here: *Tricolporopollenites cognitus* W. KR and *Intratriporopollenites ollivierae* G R.

We have identified some pollen of *Nypa*, a mangrove palm, in NH48. In the London Basin, it ranges from the London Clay to the Bournemouth Freshwater Beds. In the Paris Basin, *Nypa* pollen is common from the base of the Cuisian (including the Laon Sands). We have drawn attention to its presence in the base of the upper Sparnacian, but the stratigraphic position of the horizons containing *Nypa* needs re-examination, e.g. at the Sparnacian stratotype of Mont-Bernon. According to the microplankton data (presence of *Wetzeliella meckelfeldensis*), the horizons are Cuisian (Laurain et al. 1983), like the whole of the clay-lignite facies of the Epernay–Montagne region of the Reims valley in the Marne.

Amongst the Dinophyceae, *Wetzeliella astra* is represented by several specimens from NH48. In the absence of *W. meckelfeldensis*, its range delimits the zone of *W. astra* defining the base of the Eocene (Costa et al. 1978, Chateauneuf and Gruas–Cavagnetto 1978). The recognition of this zone is often impossible by direct means on account of the absence of a marker (Knox, Harland and King 1983, Morton, Backman and Harland 1983, Dupuis, De Coninck et al. in press).

At Newhaven, the zone can be clearly identified in the top of the Woolwich Beds.

## III. Discussion on the environment and stratigraphy

The Newhaven Tertiary includes two very different sedimentary environments.

The first represents a regressive, arenaceous advance into a sea with a stable level. An inshore marine sequence is succeeded by a continental one, in which emergent surfaces were subjected to pedogenesis, next to a network of fluvial channels.

The second, resulting from the Londinian transgression, begins with a widespread facies representing, in part at least, a peaty coastal plain. It continues with a series of facies, which are a reverse of the first situation, in becoming increasingly subject to marine influence. A lagoon with '*Cyrena*' follows the peaty beds, in turn followed by shell beds with oysters, and finally the more open sea of the London Clay.

The increase in number and diversity of microplankton, from bottom to top of the Woolwich Beds, illustrates well the increasingly open environment. On the other hand, the sporopollen associations show a certain independence from other changes in vegetation, the Woolwich Marine Beds and lower shell beds presenting the same basic flora. In the sporopollen, the most important change is near the top of the Woolwich Beds with the appearance of a taxodiacean element, as in the London Clay, and of *Nypa*, the mangrove palm tree. The first appearance of mangroves would thus be slightly earlier at Newhaven (*W. astra* zone) than in the Paris Basin (*W. mickelfeldensis* zone, Mt Bernon), but much earlier than in the Belgian Basin (upper Ypresian).

The glauconitic sands (Woolwich Marine Beds) at Newhaven, which correlate with the Landenian of Epinois and Looksbergen in Belgium, have proved to be stratigraphically younger than the Bracheux Sands of the Paris Basin. The view that Thanetian glauconitic sands are diachronous, already suggested on sedimentary grounds (Broeckman 1978, Dupuis et al. 1982), is thus confirmed biostratigraphically.

Higher up, at the top of the Woolwich Marine Beds, there is agreement on the Thanetian/Ypresian boundary (*sensu* Hardenbol and Berggren 1978), especially due to the presence of *Wetzeliella astra.* The appearance of London Clay facies at the beginning of the *W. astra* zone is later than in the London Basin, but probably contemporary with the Château de la Bruyère Clay at St-Josse and St-Aubin, on the other side of the English Channel (Dupuis et al. 1984).

## IV. Conclusions

The above study is certainly not exhaustive, the sedimentary, mineralogical and palaeontological aspects requiring yet more thorough examination. Nevertheless, this preliminary study has yielded new information. The lithological description of the section has facilitated the distinction of two different sedimentary regimes.

The first, lithostratigraphically attributable to the Woolwich Marine Beds and the Woolwich Freshwater Beds, is especially arenaceous. Similar to certain Thanetian sequences in the Paris Basin, it records the end-Palaeocene regression.

The second, which is argillaceous, comprises the remainder of the Woolwich Beds and includes some classical Sparnacian facies (clays with lignite, shell beds with '*Cyrena*', limestone with oysters). It corresponds to the Londinian transgression which commences before the Ypresian and reaches a climax in the London Clay.

The palynology clarifies the palaeoenvironment and clearly confirms the increasing marine influence in the argillaceous part of the Woolwich Beds. It also shows that the major change in flora is at the top of the Woolwich Beds, and at the base of the Ypresian, with the appearance of mangrove and of Taxodiaceae which characterize the London Clay. The main contribution of palynology to biostratigraphy is to suggest that the Woolwich Marine Beds are younger than the Bracheux Sands, which supports the idea that the Thanetian sands are diachronous. Also, the recognition of the *Wetzeliella astra* zone locates the base of the Ypresian at the top of the Woolwich Beds.

These new data contribute to and clarify the stratigraphic and geodynamic setting of the north-west Paris Basin in the Lower Tertiary, which is currently being revised.

## Acknowledgements

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# Book review

***Birding in Kent.*** Don Taylor. Pica Press (Helm Information Ltd). n.d. [1996]. 168 pp. £11.95. ISBN 1 873403 53 4.

This title is a sequel to the author's 1985 book similarly entitled *Birdwatching in Kent.* An attractive front cover by David Boys features a Dungeness landscape including three species originally named from the county — Sandwich tern, Dartford warbler and Kentish plover. Useful to newcomers to the region is an introductory chapter which includes the relevant birding and conservation bodies active in Kent as well as tips on field guides and equipment.

Kent is blessed with a great diversity of habitats which are discussed in some detail. Man's considerable influence on these is explored and some such as the creation of gravel-pits and reservoirs have been beneficial in a county with no natural standing water.

A ten-year study of Don's local patch makes for particularly interesting reading, revealing a man with a great passion for the birds and other wildlife in his area. The patch is just over 100 hectares in extent and comprises a variety of habitats. During the study 170 species were recorded; of these 88 occurred annually, with 38 species breeding on a regular basis. The importance of recording on local patches as a conservation tool is rightly emphasized. Census results revealing changes at local level can reflect national trends, such as declines in willow warblers, or may reveal changes effected by more local influences, such as in farming practice or the consequence of the 1987 great storm, which created suitable woodlark breeding habitat. Part of the fun of local patchwork is turning up the unexpected. None was more so than the amazing spectacle of a white-throated needletail discovered by Don in May 1991, a photograph of which appears on the back cover.

The excitement and military-like organization of bird races is followed by a thoroughly exhausting year — 1994 — in Kent where Don attempts to record 250 species. With his detailed knowledge of the region's birds combined with some good luck, he almost achieves his tally. While the twitching fraternity may admire his indefatigable stamina, others may ponder the green credentials of driving 20,000 miles in his quest.

A useful birdwatching calendar indicates the optimal time of year to visit various sites for particular birds. As well as the well-known locations, Don encourages the reader to explore lesser-known sites. The most extensive chapter consists of a systematic list of birds recorded in Kent from 1985 to 1994, using weekly bar charts to indicate the best times to locate particular species. Some of these are somewhat misleading — for instance the key suggests that the sparrowhawk is seen less than annually between June and August, which is clearly inaccurate. The bar charts are supplemented with useful backup information.

Overall a useful guide to birding in Kent with an appeal for novice and expert, patchworker and twitcher. A recommended read!

NEIL ANDERSON

# Additions to the flora of Hyde Park and Kensington Gardens in 1995

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## Summary

Seventeen additions to *The flora of Hyde Park and Kensington Gardens, 1988–1993* (Wiltshire 1994) were recorded during the 1995 season. Eight, mainly casuals, appeared as a result of earth-moving operations at the Hyde Park Lido. In Kensington Gardens three were random finds, but established communities of three others were found in a secluded enclosure. Renewed wildflower planting by the Hyde Park authorities accounted for *Lathyrus pratensis* meadow vetchling, last recorded here in 1948 (Kent 1950). The remaining additions consisted of two common species—*Solanum nigrum* and *Deschampsia cespitosa*—which had been inadvertently omitted from the report of the 1988–1993 survey. Of these additions eleven are new park records.

As previously, the combined Hyde Park and Kensington Gardens are referred to as the 'park'.

## Introduction

During the hot summer of 1995 a jungle growth of weeds appeared at the Hyde Park Lido on soil laid bare by landscaping works. Among them the following are new park records: *Consolida ajacis* larkspur, *Silene gallica* small-flowered catchfly, *Eruca vesicaria* ssp. *sativa* garden rocket, *Hordeum jubatum* foxtail barley, *Panicum capillare* witch-grass, and *Setaria verticillata* rough bristle-grass. *Panicum miliaceum* common millet had not been recorded in the park since 1962 (Allen 1965).

Many locally scarce species, such as *Amaranthus retroflexus* common amaranth, *Malva neglecta* small mallow, *Sisymbrium orientale* eastern rocket, *Descurainia sophia* flixweed, *Erysimum cheiranthoides* treacle mustard, *Diplotaxis muralis* annual wall-rocket, *Hirschfeldia incana* hoary mustard, *Erodium cicutarium* common stork's-bill, *Helianthus rigidus* sunflower, and a very fine white *Heliotropium europaeum* heliotrope, a Mediterranean plant, were also present. All these were recorded from late July to 9 August, on which day they succumbed to the mower. Late in the season another alien grass new to the park was found by the Lido—*Digitaria ciliaris* tropical finger-grass.

The Kensington Gardens finds were more varied in character.

Established small communities of *Hieracium trichocaulon* hawkweed and *Carex spicata* spiked sedge—both new records—as well as a patch of *Hordeum secalinum* meadow barley, were noted in a normally locked enclosure by The Long Water. David Allen had found this grass on verges throughout the park, where it had been sown following drought in 1959 (Allen 1965), but none was seen during 1988–1993.

A handsome plant of *Pulicaria dysenterica* fleabane, also not recorded in the park since Allen's survey, flourished during August at the foot of a young lime tree some 100 metres from The Long Water. The two remaining new park records from Kensington Gardens were provided by grasses—*Vulpia myuros* rat's-tail fescue and the casual *Setaria verticillata* var. *ambigua* rough bristle-grass. Large bunches of the latter species were later observed on a flower-stall in Queensway, half a mile away.

*Lathyrus pratensis* meadow vetchling, not recorded in the park since 1948 (Kent 1950), returned in the course of renewed wildflower planting in the Hyde Park Meadow during December. The experimental introductions of winter 1989–90 (not 1988–9 as stated in Wiltshire (1994)) were modest in scale and only moderately successful. Even the more successful species, such as cowslips, were thin on the ground and barely noticeable. Late-flowering plants tended to become smothered in grasses, while other species simply failed to thrive.

At the same time, despite a careful grass-management regime designed to protect herbage and reduce nutrient levels, there has so far been virtually no natural wildflower regeneration in The Meadow. For them to become a feature it was clear that further introductions would be necessary. Species currently or in the past native to the park were chosen, and in December 1995 100–200 'plugs', grown that season from seed, of each of the following were planted:

*Ranunculus acris* meadow buttercup
*Primula vulgaris* primrose
*P. veris* cowslip
*Filipendula ulmaria* meadowsweet
*Lotus corniculatus* bird's-foot trefoil
*Lathyrus pratensis* meadow vetchling
*Prunella vulgaris* selfheal
*Galium verum* lady's bedstraw
*Centaurea nigra* common knapweed
*Leucanthemum vulgare* oxeye daisy

Additionally, 5,000 bulbs of *Hyacinthoides non-scripta*, the native bluebell, were planted in shady ground on the southern fringe of The Meadow.

## LIST OF SPECIES

Particulars of 1995 additions to the 1988–93 flora are as follows, with earlier records by J. B. L. Warren (1871, 1875), D. H. Kent (1950) and D. E. Allen (1965) indicated by the initials W, K and A. **H** = Hyde Park and **K** = Kensington Gardens.

### RANUNCULACEAE

*Consolida ajacis* larkspur. **H** – one plant in disturbed ground at Lido, July 1995.

### CARYOPHYLLACEAE

*Silene gallica* small-flowered catchfly. **H** – 3 plants in disturbed ground at Lido, July 1995.

### BRASSICACEAE

*Eruca vesicaria* ssp. *sativa* garden rocket. **H** – 3 plants in disturbed ground at Lido, July 1995.

### FABACEAE

K *Lathyrus pratensis* meadow vetchling. **H** – 100 'plugs' planted in The Meadow, December 1995.

### SOLANACEAE

WKA *Solanum nigrum* black nightshade. **HK** – common on disturbed ground.

### ASTERACEAE

*Hieracium trichocaulon* hawkweed. **K** – about 6 plants near the W bank of The Long Water, July 1995.

A *Pulicaria dysenterica* fleabane. **K** – a substantial plant at foot of young lime tree, August 1995.

### CYPERACEAE

*Carex spicata* spiked sedge. **K** – several plants along grass verge by railings between Italian Gardens and Peter Pan Statue, June 1995.

### POACEAE

*Vulpia myuros* rat's-tail fescue. **K** – a few plants by Bayswater Road, inside railings of Buck Hill Lodge garden, June 1995.

WK *Deschampsia cespitosa* ssp. *cespitosa* tufted hair-grass. **H** – at several sites in The Meadow, May 1995.

*Hordeum jubatum* foxtail barley. **H** – one plant in disturbed ground at Lido, July 1995.

WKA *H. secalinum* meadow barley. **K** – a small patch in enclosure between Italian Gardens and Peter Pan Statue, July 1995.

*Panicum capillare* witch-grass. **H** – one plant in disturbed ground at Lido, July 1995.

A *P. miliaceum* common millet. **H** – one plant in disturbed ground at Lido, July 1995.

*Setaria verticillata* rough bristle-grass (with backward-directed barbs). **H** – one plant in disturbed ground at Lido, July 1995.

*S. verticillata* var. *ambigua* rough bristle-grass (with forward-directed barbs). **K** – one plant at edge of shrubbery near Marlborough Gate, August 1995.

*Digitaria ciliaris* tropical finger-grass. **H** – one plant by path at Lido, October 1995.

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# Book review

***A dictionary of plant lore.*** Roy Vickery. Oxford University Press. 1996. 437 pp. £14.99. ISBN 0 19 866183 5.

'Ethnobotany' is a fairly new term apparently coined to describe tribal peoples' knowledge of plants and their properties, together with the cultural uses and history of this use. More recently the idea that there is a mass of valuable cultural history and knowledge of plants in 'advanced' countries such as England has become more widely accepted — indeed ethnobotany is now seen as an increasingly relevant subject in all human societies.

In England there is a history of publications in this area from the medieval herbals to the classic *Englishman's flora* of Geoffrey Grigson. Grigson's idea was that as *men and plants are old acquaintances . . . I have taken those plants . . . found in the British Isles . . . which have their own human dossier.* Roy Vickery has worked to develop these 'human dossiers' on our plants. He has been collecting folk traditions and knowledge about plants and publishing the information over a number of years in his periodical *Plant Lore — Notes and News.* He has now put together a great mass of this wonderful oral history, all from original sources, i.e., the ordinary people of these islands. Sampling the book I would suggest that the number of these informants must be at least three thousand. The result is a major contribution to an understanding of the cultural context of plants in the UK and Ireland.

The association and acceptance of the scientific and the cultural together is something which must increase both our understanding and our appreciation of the natural world. The diversity of entries and sources in this book alone are a delight; I think the author is to be congratulated for the eclecticism of his approach. There are of course some minor gaps; the entry on money-trees does not include the tradition extant in both England and Ireland of hammering coins into the bark of certain trees 'for luck'. Trees with thousands of such coins can be found at Clanenagh in Ireland and Ingleton in England — and probably many other places.

Many of the traditions described and experiences related are old, even ancient. However one of the most fascinating aspects of the dictionary is the very contemporary entries for new customs and techniques, such as that which explains how the children of the nineties harden their conkers — using a microwave oven! He points out that in the past the publication of Grigson's book and the work on the lore of schoolchildren by Lisa and Iona Opie appears to have discouraged further publications about these matters in the (mistaken) view that the subject had been 'covered'. I doubt if this will happen in future because Roy Vickery himself continues to collect information, and by making it so clear that he depends on his myriad informants he has almost certainly sponsored new interest in all forms of oral history. What the existing edition shows very clearly is that there is a wealth of knowledge about that complex interaction between plants and people throughout these islands, which makes up a vital part of our heritage.

J. EDWARD MILNER

# The flora of Fryent Country Park, Middlesex

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## Abstract

A survey of the vascular plant flora of Fryent Country Park was undertaken between 1983 and 1996. The species recorded are listed, together with a small number of earlier records, and that of one charophyte. A list of bryophyte species, compiled largely by Elinor Wiltshire, is presented. The flora reflected that of the lowland countryside habitats including hay meadows, hedgerows, woodland, scrub and ponds. The Park is predominantly on neutral, London Clay soils, though there is acid grass heath on the pebble gravel of Barn Hill. A high proportion of the species have been introduced, some of which have persisted or become established. The various sources of the introduced species are discussed.

## Introduction

This paper presents the results of a survey of the flora of Fryent Country Park, Middlesex, from 1983 to 1996. The flora of the Country Park as a whole has not previously been listed, though it is not the purpose of this paper to repeat the descriptions of the area (Williams and Northcroft 1992), nor of individual habitats, and for which reference should be made to papers on the flora of hedgerows (Williams and Cunnington 1985), hedgerow and woodland history (Williams, McLauchlin and Harrison 1987), Humphry Repton's landscaped woodland (Williams, Cunnington and Hewlett 1985), grass-heath and old grasslands on Barn Hill (Williams and Bertrand 1988), and of ponds (Williams 1990). Burton (1983) suggested that the flora of the Country Park area was under recorded in comparison with similar areas; and there appear to be few historical records of the flora of the Park area (Kent 1975).

The area surveyed is a 103-hectare remnant of the rural countryside of Middlesex, about 15 km north-west of central London (Figures 1 and 2). It is now within the London Borough of Brent and was made a Country Park by Brent Council in 1984 and designated as a Local Nature Reserve in 1991. Since the expansion of London in the 1920s to 1930s, the Park has been surrounded by suburbia and bisected by the A4140 Fryent Way. The Country Park is a semi-natural landscape, typical of the former rural landscape of the upper Brent basin (Figure 3). London Clay covers most of the Park giving rise to neutral soils, with the exception of pebble gravel that caps Barn Hill and on which acid

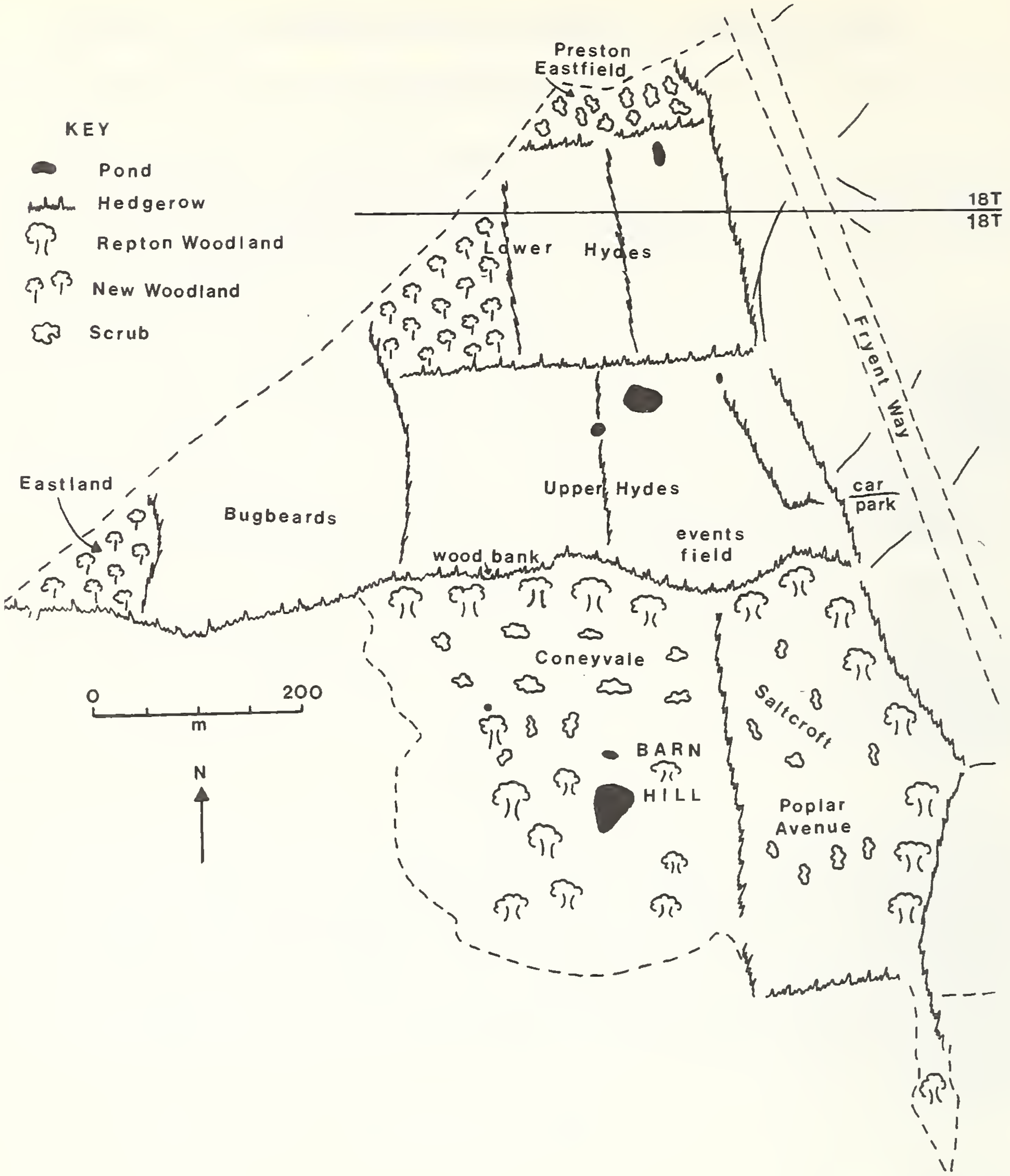

FIGURE 1. Sketch map of the Harrow (Wembley) parish side of Fryent Country Park.

grass-heath has developed. There are approximately 11 km of hedgerow, and a variety of neutral grasslands including meadows that are harvested for a hay crop. The belts of woodland on the summit of Barn Hill and its northern and eastern edge were part of the landscaping of the Wembley Park estate undertaken by Humphry Repton in 1793. During recent decades scrub has grown on the slopes of Barn Hill, though as a consequence, old grassland has been lost. Scrub has developed at several other locations in the Park, and new woodlands have been planted at Little Cowlays, Beane Hill, Lower Hydes, Eastland and Summers Croft. Horses are grazed in several fields at Bush Farm on the east of the Park. An orchard at Bush Farm is under restoration. A range of about 28 ponds includes old farm ponds that have been restored and recently created ponds. The Park is managed by Brent Council and by volunteer groups.

## Methods

The majority of the field work was undertaken by the author on numerous visits between 1983 and 1996. The list includes both opportunistic records and those

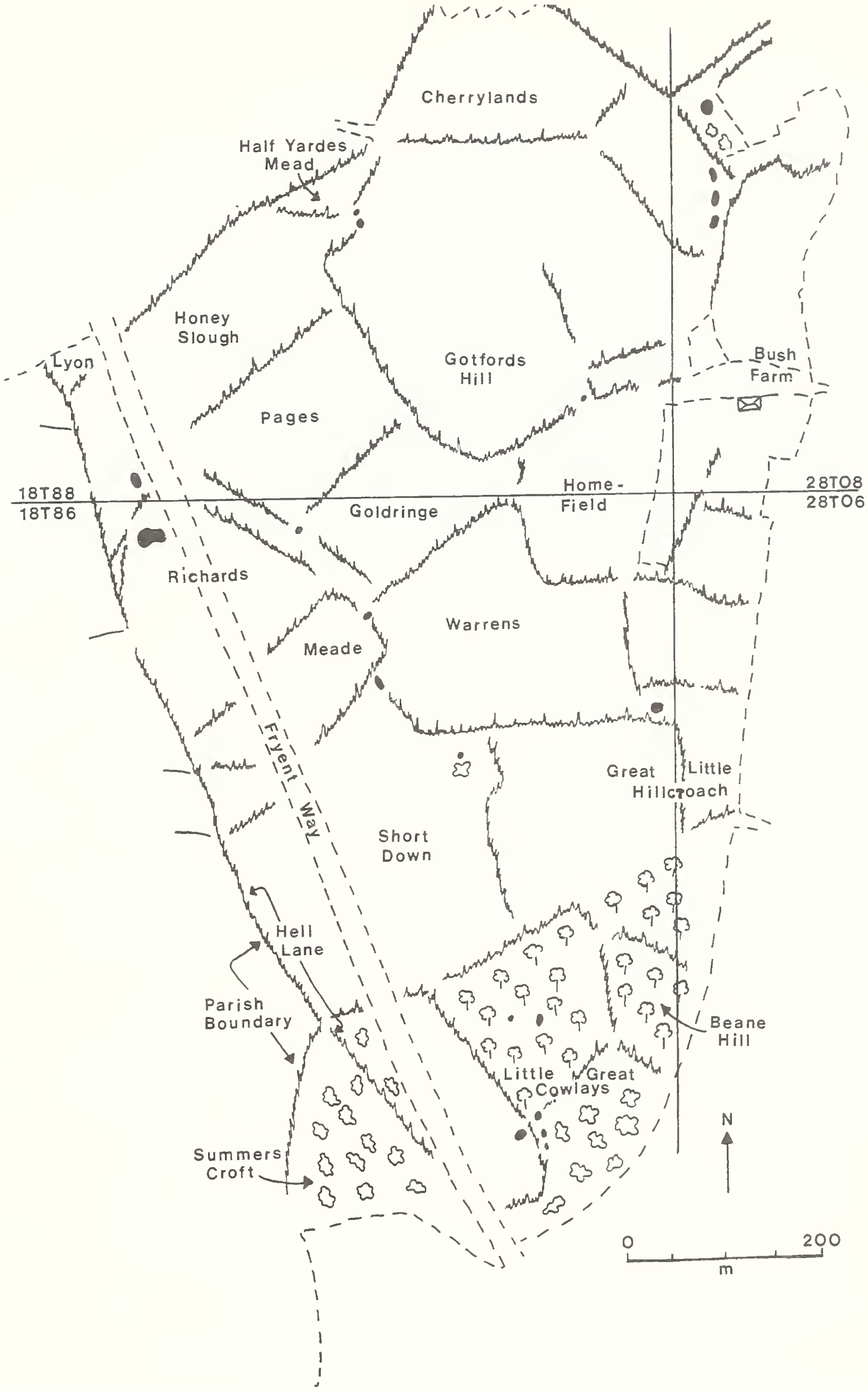

FIGURE 2. Sketch map of the Kingsbury parish side of Fryent Country Park. See Figure 1 for the key.

FIGURE 3. Fryent Country Park in midsummer. *Photo: L. R. Williams*

from more systematic surveys of the vegetation. Preliminary surveys were undertaken by the late Win Cunnington in about 1977 and by C. J. Gardiner of Brent Council in 1982. Some records have been contributed by visiting naturalists, while others have refereed the identification of specimens, and are mentioned in the acknowledgements. The bryophyte list was mainly the work of Elinor Wiltshire, following a preliminary survey by the author. For the vascular plants the order and nomenclature follow Stace (1991), except for that of the brambles which follows Edees and Newton (1988). Authorities for the nomenclature and order of the other groups of plants were Moore (1986) for the Characeae (charophytes), Watson (1981) for the Hepaticae (liverworts), and Smith (1978) for the Musci (mosses).

## Results

Species listed below were recorded during the survey from 1983 to 1996, unless otherwise stated. A subjective indication of frequency is given where possible using the ACFOR scale of abundant, common, frequent, occasional and rare.

### PTERIDOPHYTA

*Equisetum arvense* field horsetail: recorded only in 1988 on the introduced substrate of roadside mounds alongside Fryent Way.

*Ophioglossum vulgatum* adder's tongue: one to two colonies in old grassland in Saltcroft.

*Pteridium aquilinum* bracken: at one location on pebble gravel on Barn Hill.

*Dryopteris filix-mas* male fern: occurs in scrub and woodland.

*Dryopteris dilatata* broad buckler fern: in scrub/woodland at Saltcroft.

*Azolla filiculoides* water fern: a casual, introduced to some ponds, first recorded in the early 1990s.

### PINOPSIDA

*Taxus baccata* yew: several young trees are established in woodland, scrub and hedgerows, almost all from seeds voided by birds. There is evidence that a few have been transplanted from gardens.

## MAGNOLIOPSIDA

### MAGNOLIIDAE

*Nymphaea alba* white water lily: introduced into ponds.

*Nuphar lutea* yellow water lily: introduced into fishpond on Barn Hill.

*Ceratophyllum demersum* rigid hornwort: occurs in some ponds.

*Caltha palustris* marsh marigold: introduced into one pond from a garden pond in the late 1980s.

*Nigella damascena* love-in-a-mist: recorded only in 1987 on the introduced substrate of roadside mounds alongside Fryent Way.

*Anemone nemorosa* wood anemone: in a hedgerow/woodland belt at Barn Hill.

*Ranunculus acris* meadow buttercup: abundant in hay meadows and other grasslands.

*Ranunculus repens* creeping buttercup: common in grasslands.

*Ranunculus auricomus* goldilocks buttercup: in one hedgerow/woodland belt at Barn Hill.

*Ranunculus sceleratus* celery-leaved buttercup: frequent in pond margins. It has increased in abundance as ponds have been restored and has colonized newly created ponds.

*Ranunculus lingua* greater spearwort: introduced to several ponds.

*Ranunculus ficaria* lesser celandine: common in hedgerows and woodland.

*Ranunculus peltatus* pond water crowfoot: frequent in ponds, either naturally or following introduction from nearby ponds.

*Aquilegia vulgaris* columbine: rare, probably as a garden escape and from waste material.

*Mahonia aquifolium* Oregon grape: occasional, under scrub, Lower Hydes.

*Papaver somniferum* opium poppy: casual on waste material.

*Papaver rhoeas* common poppy: on disturbed ground.

*Papaver dubium* long-headed poppy: in 1991 with *P. rhoeas*, on topsoil imported to car park during the previous year.

*Meconopsis cambrica* Welsh poppy: casual garden escape, recorded on a footpath in 1992.

*Fumaria officinalis* common fumitory: in 1992 on topsoil imported to cover roadside mounds.

*Platanus × hispanica* London plane: as a planted tree at Summers Croft. Has also been noted as shoots growing from a wooden bollard for at least two years.

*Ulmus procera* English elm: abundant in hedgerows, woodland and by suckering to create scrub. There is evidence that it was extensively planted in some hedgerows in previous centuries, and in some of the landscape woodland planted by Humphry Repton in 1793 (Williams, Cunnington and Hewlett 1985). All the surviving standard trees were killed during the Dutch elm disease epidemic of the mid 1970s, though the rootstock has since suckered extensively.

*Humulus lupulus* hop: found in the orchard at Bush Farm in 1989, shortly after the orchard was fenced to prevent grazing by horses. The size of the plant(s) has since increased considerably.

*Morus nigra* black mulberry: there is a single old tree in the orchard at Bush Farm. The tree had collapsed during or since the 1950s, though it has regrown noticeably since 1989 when the orchard was fenced to prevent grazing by horses.

*Urtica dioica* common nettle: common.

*Juglans regia* walnut: planted during the early 1990s at Bush Farm orchard and in nearby hedgerows.

*Fagus sylvatica* beech: planted on Barn Hill as part of Humphry Repton's landscaping of 1793. There are a few younger trees.

*Castanea sativa* sweet chestnut: planted on Barn Hill as part of Humphry Repton's landscaping of 1793. Only a few, self-sown trees have been recorded. Planted during the 1980s at Little Cowlays within a new woodland scheme.

*Quercus cerris* Turkey oak: there is a large tree amongst the Humphry Repton landscaping on the summit of Barn Hill and several self-sown trees in the surrounding woodland.

*Quercus robur* pedunculate oak: abundant in hedgerows, in the Repton landscaped woodland, and in scrub on Barn Hill particularly in Coneyvale where almost pure stands of oak scrub have developed.

*Quercus rubra* red oak: planted in the 1980s at Summers Croft on site of former prefab housing.

*Quercus frainetto* Hungarian oak: during the latter part of this survey some atypical oak trees were inspected amongst the many 'pedunculate oaks' in the Repton landscaped belts around the northern edge of Barn Hill. One, in particular, of these differed from the above-listed species and appeared to be *Q. frainetto* on the basis of a winter identification and fallen leaves.

*Betula pendula* silver birch: occasional on the London Clay areas of the Country Park, but more common on the acid soils of Coneyvale, Barn Hill, where both self-sown and planted trees have rapidly seeded into areas of coppiced oak scrub.

*Alnus glutinosa* alder: planted during the mid 1980s in new woodlands at Little Cowlays and elsewhere in the Park.

*Alnus incana* grey alder: planted as a new woodland at Beane Hill in the late 1980s from nursery stock erroneously labelled as *A. glutinosa*.

*Alnus cordata* Italian alder: occasional individuals planted, probably during the 1970s at Little Cowlays and Summers Croft.

*Carpinus betulus* hornbeam: planted by Humphry Repton as part of the Barn Hill landscaping, and where self-sown trees are frequent. Evidence suggests that it did not occur naturally in local hedgerows or woodlands.

*Corylus avellana* hazel: frequent, but as isolated shrubs in old hedgerows and woodland, though some planted specimens are known.

*Corylus maxima* filbert: a debatable record, based on *Corylus* material introduced to the orchard at Bush Farm and an extension to it in the early 1990s. Two transplants were donated from a plat at Oldbury, Ightham, Kent, together with some seed from which other plants were raised in the Barn Hill Conservation Group nursery. Some of the plants are considered to be similar to *C. maxima*, though they may contain a high proportion of *C. avellana* parentage. In 1995 the first nuts were produced from the Bush Farm shrubs.

*Chenopodium polyspermum* many-seeded goosefoot: on disturbed ground.

*Chenopodium ficifolium* fig-leaved goosefoot: on disturbed ground.

*Chenopodium album* fat hen: on disturbed ground.

*Atriplex prostrata* spear-leaved orache: on disturbed ground.

*Stellaria media* common chickweed: on disturbed ground.

*Stellaria holostea* greater stitchwort: frequent in hedgerows.

*Stellaria graminea* lesser stitchwort: in old grasslands.

*Cerastium tomentosum* snow-in-summer: one mat, established from at least 1983–1996, at side of a footpath, probably as a garden escape.

*Cerastium fontanum* common mouse-ear: frequent in grasslands.

*Sagina procumbens* procumbent pearlwort: in horse-grazed grassland.

*Lychnis flos-cuculi* ragged robin: rare, at two sites, one in 1982 and one in 1983.

*Agrostemma githago* corncockle: all four records were noted in July 1991. Two of these were on the imported substrate of roadside mounds, respectively on the east and west sides of Fryent Way. The other two records were in the north of the Country Park. Three plants were noted in Lyon field and four plants in Lower Hydes West, both of which were hay meadows, and at positions with no recent history of ground disturbance. The flora of both meadows had been surveyed annually since 1985, with no evidence of corncockle. Suggested explanations include climatic effects upon a buried seed bank, or deliberate planting?

*Silene latifolia* white campion: occasional.

*Silene dioica* red campion: frequent in hedgerows and scrub.

*Persicaria amphibia* amphibious bistort: recorded in 1988 in a pond and probably introduced.

*Persicaria maculosa* redshank: on disturbed ground and elsewhere.

*Persicaria lapathifolia* pale persicaria: occasional.

*Fagopyrum esculentum* buckwheat: one plant recorded in 1987 on imported substrate of roadside mounds.

*Polygonum aviculare* knotgrass: on footpaths and trampled areas.

*Fallopia japonica* Japanese knotweed: probably from landfill on the site of former prefab housing at Summers Croft, and on the imported substrate of roadside mounds. It has proved difficult to eradicate, but regular pulling has prevented it spreading.

*Fallopia convolvulus* black bindweed: occasional, on disturbed ground and on imported topsoil.

*Rumex acetosella* sheep's sorrel: on the grass heath and other grasslands at Coneyvale, Barn Hill.

*Rumex acetosa* common sorrel: frequent in grasslands.

*Rumex crispus* curled dock: frequent in grasslands and on disturbed ground.

*Rumex pratensis* = *R. crispus* × *R. obtusifolius*: recorded in the north-east of the Country Park.

*Rumex conglomeratus* clustered dock: occasional in ponds.

*Rumex sanguineus* wood dock: frequent in grasslands.

*Rumex obtusifolius* broad-leaved dock: in grasslands and on disturbed ground.

*Hypericum perforatum* perforate St John's wort: occasional in scrub.

*Hypericum maculatum* imperforate St John's wort: one plant in 1992 in Richards West, which had had a recent history of ground disturbance and of waste tipping.

*Hypericum tetrapterum* square-stalked St John's wort: in meadow grassland at Honey Slough West and open scrub in Little Cowlays.

*Hypericum hirsutum* hairy St John's wort: recorded in Little Cowlays together with *H. tetrapterum.*

*Tilia* × *vulgaris* lime: planted by Humphry Repton as part of the summit landscaping on Barn Hill.

*Malva moschata* musk-mallow: recorded at the rear of private gardens.

*Malva sylvestris* common mallow: mainly on the imported substrate of roadside mounds.

*Lavatera thuringiaca* garden tree mallow: two plants by Little Hillcroach pond in the early 1990s and almost certainly of planted origin.

*Viola odorata* sweet violet: one plant, apparently long-established adjacent to an enclosed drain in Honey Slough West field, and as introductions in the vicinity of Fryent Way car park.

*Viola riviniana* common dog-violet: in woodland on Barn Hill, and occasionally elsewhere in the Country Park.

*Viola* × *wittrockiana* garden pansy: on disturbed ground following introduction of waste material, and occasionally elsewhere.

*Bryonia dioica* white bryony: in hedgerows.

*Populus alba* white poplar: planted.

*Populus nigra* black poplar: young trees planted from nursery stock in the Gotfords Hill area.

*Populus nigra* 'Italica' Lombardy poplar: the avenue of Lombardy poplars on Barn Hill was possibly planted in the 1930s.

*Populus* × *canadensis* 'Serotina' black Italian poplar: there is a standard tree at Bush Farm, and two nearby, towards the summit of Gotfords Hill.

*Salix pentandra* bay willow: several trees have grown from setts introduced in 1989 at Great Cowlays.

*Salix fragilis* crack willow: occasionally as a standard tree in hedgerows, on ditch sides and by ponds. Many younger trees have been planted.

*Salix alba* white willow: introduced. Several trees grown from setts planted at Great Cowlays field, and occasionally planted elsewhere.

*Salix* × *sepulcralis* weeping willow: planted, possibly in the 1970s, at Little Cowlays, and during the 1980s at Great Cowlays.

*Salix triandra* almond willow: introduced. Several trees grown from setts planted at Great Cowlays field. The trees could possibly be a variety or hybrid of the almond willow.

*Salix purpurea* purple willow: introduced. Several trees at Great Cowlays were planted as setts.

*Salix viminalis* osier: most, if not all trees have been introduced, and now planted as setts from established trees.

*Salix caprea* goat willow: occasional in hedgerows and in light scrub, but also as a planted tree.

*Salix* × *reichardtii* = *S. caprea* × *S. cinerea*: occasional in hedgerows and in light scrub.

*Salix cinerea* grey willow: frequent in hedgerows and in scrub.

*Salix matsudana* contorted willow: planted at Summers Croft, and later at Great Cowlays.

*Sisymbrium officinale* hedge mustard: frequent in hedgerows, rough grassland and on disturbed ground.

*Alliaria petiolata* garlic mustard: occasional in hedgerows and scrub.

*Isatis tinctoria* woad: introduced to the herb garden at Bush Farm in the 1980s, and now occurs also as an escape in the orchard and hedgerows.

*Erysimum cheiranthoides* treacle mustard: recorded in 1987 on the imported substrate of roadside mounds.

*Hesperis matronalis* dame's violet: occasional on disturbed ground of imported substrate of roadside mounds or waste tipping.

*Barbarea vulgaris* winter cress: frequent in hedgerow edges and ditch sides.

*Rorippa palustris* marsh yellow cress: on the exposed mud of ponds.

*Rorippa sylvestris* creeping yellow cress: on the exposed mud of ponds.

*Rorippa amphibia* great yellow cress: in pond margins.

*Armoracia rusticana* horseradish: on roadside mounds, other imported substrates and elsewhere.

*Cardamine pratensis* cuckoo flower: occasional in grasslands.

*Cardamine impatiens* narrow-leaved bitter-cress: frequent. Although previously considered extinct in Middlesex between 1901 and its rediscovery at Fryent Country Park in 1985, it was probably present throughout that period. The 1901 record was 'near Harrow' (Kent 1975). Now occurs on the London Clay in the north of the Country Park in hedgerows, scrub edges and on disturbed ground.

*Cardamine flexuosa* wavy bitter-cress: in ditches and pond sides.

*Cardamine hirsuta* hairy bitter-cress: common on rough grasslands and on disturbed ground.

*Lunaria annua* honesty: mainly occurs as a garden escape.

*Lobularia maritima* sweet alison: on disturbed ground in the vicinity of waste material.

*Capsella bursa-pastoris* shepherd's purse: on grasslands grazed by horses.

*Thlaspi arvense* field penny cress: on disturbed roadside soil, and on the imported substrate of roadside mounds.

*Lepidium draba* hoary cress: on roadsides and on imported soils.

*Coronopus squamatus* swine cress: occasional on disturbed ground.

*Coronopus didymus* lesser swine cress: rare on disturbed ground, possibly introduced with waste material.

*Diplotaxis tenuifolia* perennial wall-rocket: on roadside mound, probably on imported substrate.

*Brassica napus* rape: occasional, on imported substrate.

*Brassica rapa* turnip: frequent, as a garden escape.

*Sinapis arvensis* charlock: frequent on disturbed ground and on the imported substrate of roadside mounds.

*Raphanus raphanistrum* wild radish: on disturbed soil at a field entrance between Homefield and Warrens.

*Reseda luteola* weld: not recorded since 1977, but probably overlooked.

*Reseda lutea* wild mignonette: casual on the imported substrate of roadside mounds.

*Primula vulgaris* primrose: occasionally in hedgerows and in a woodland glade, though possibly planted.

*Lysimachia nummularia* creeping jenny: at one location in scrub woodland, Saltcroft, Barn Hill.

*Lysimachia punctata* dotted loosestrife: occasional garden escape.

*Anagallis arvensis* scarlet pimpernel: occasional on disturbed ground.

*Ribes nigrum* blackcurrant: occasional, and probably planted.

*Ribes sanguineum* flowering currant: one plant in damp woodland on Barn Hill, possibly introduced.

*Ribes uva-crispa* gooseberry: one plant was noted for several years in a hedgerow, possibly from nearby gardens or former allotments.

*Crassula helmsii* New Zealand pigmyweed: introduced amongst other pond plant material. Occurs in small quantities in shallow water at the fishpond.

*Sedum spectabile* butterfly stonecrop: as a garden throw-out.

*Spiraea douglasii* steeplebush: naturalized, possibly planted, in hedge, near Half Yardes Mead.

*Filipendula ulmaria* meadowsweet: in hedgerows and grasslands, but seldom far from a hedgerow.

*Rubus idaeus* raspberry: Barn Hill. A quantity of rootstock was successfully transplanted from there to a new hedge.

*Rubus fruticosus* agg. bramble: abundant throughout, but only two microspecies have been identified at the Country Park.

*Rubus laciniatus* cut-leaf bramble: on the site of former prefabs and elsewhere in the Country Park.

*Rubus cinerosus*: Recorded in 1933 on Barn Hill (Avery and Watson 1946, Kent 1975).

*Potentilla anserina* silverweed: recorded as an introduction only, on the imported substrate of roadside mounds in 1987.

*Potentilla reptans* creeping cinquefoil: in grasslands, particularly on the more acid soils on the west of the Country Park.

*Fragaria vesca* wild strawberry: rare, in woodland, 1985.

*Geum urbanum* wood avens: first recorded only in 1988, but appears to be spreading, possibly in response to the increasing area of woodland habitats within the Country Park.

*Agrimonia eupatoria* agrimony: in old grassland at Saltcroft, Barn Hill.

*Sanguisorba officinalis* great burnet: common in three meadows in the north of the Country Park and also found in other fields in the centre of the Park. Absent from Barn Hill. The tallest British specimen was recorded at Fryent Country Park at 1.71 m. The species has been successfully grown elsewhere in the Park from local seed and from local rescue transplants of rootstock.

*Sanguisorba minor* salad burnet: introduced by a local school as part of a wildflower seed mixture, the plants were noted for few years, but have not been observed recently.

*Rosa arvensis* field-rose: in hedgerows.

*Rosa pimpinellifolia* burnet rose: there are several introduced and established plants in Little Cowlays field.

*Rosa rugosa* Japanese rose: one in hedgerow edge, Upper Hydes East, possibly from waste material.

*Rosa canina* dog-rose: frequent in hedgerows (Figure 4).

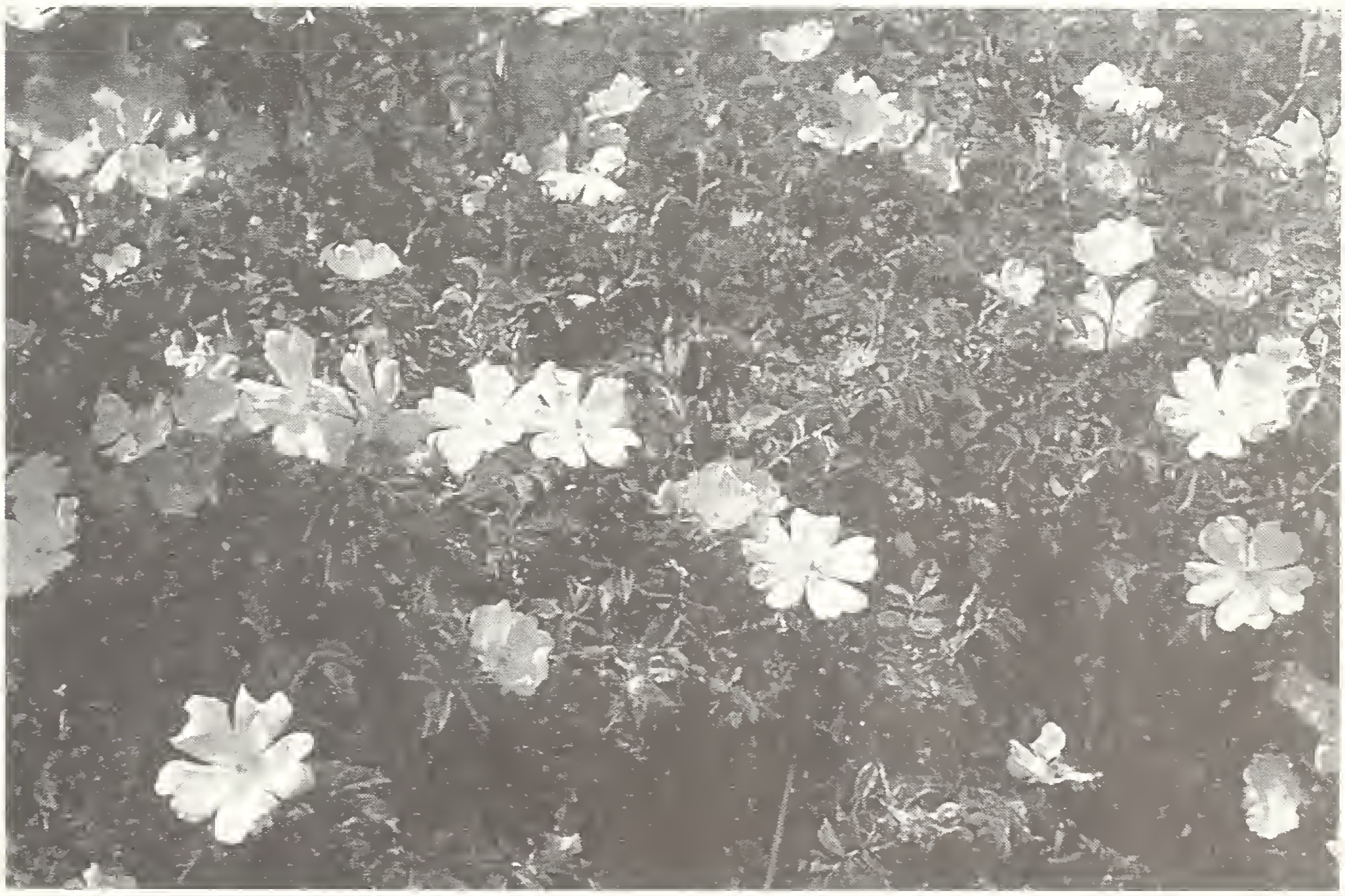

FIGURE 4. *Rosa canina*, Fryent Country Park. *Photo: L. R. Williams*

*Prunus cerasifera* cherry plum: known from hedges 10, 44 and 46 (see Williams and Cunnington (1985) for hedge reference numbers), but were probably planted in the early to mid 1980s. They flower early in the year, at which time they can be easily distinguished from the other *Prunus* species in the hedgerows.

*Prunus spinosa* blackthorn: abundant in hedgerows and the dominant shrub in many hedgerows on the east side of the Country Park.

*Prunus domestica* wild plum: mainly as a hedgerow shrub, and although displaying much variation, appear to be of bullace and/or damson, rather than of plum. There is one tree at the corner of Bush Farm orchard, and three nearby in hedge 45. There is one tree in hedge 54, and two others in the south of the Country Park that could be of hedgerow or of planted origin. The collection of trees in the restored orchard at Bush Farm includes specimens planted as a plum, a greengage, a damson and a bullace.

*Prunus avium* wild cherry: occurs in the hedgerow/woodland belt on the northern boundary of Barn Hill and includes one standard tree, suggesting that it could have been planted as part of Humphry Repton's landscaping. Seedlings occur in scrub woodland on Barn Hill. Several trees were planted elsewhere in the Country Park during the 1980s.

*Prunus laurocerasus* cherry laurel: occasional in woodland on Barn Hill.

*Cydonia oblonga* quince: recently introduced to Bush Farm orchard.

*Chaenomeles speciosa* Japanese quince: long-established introduction by entrance leading to Bush Farm. A more-recently planted Japanese quince in the orchard is also considered to be this species.

*Pyrus pyraster* wild pear: occurs in three hedgerows. Trees in the belt on the northern boundary of Barn Hill suggest that it may have been planted as part of the Repton landscaping. Seed from these trees has been raised for planting in the orchard and hedgerows.

*Pyrus communis* pear: trees with large, pear-shaped fruit occur in the grassland at Saltcroft, Barn Hill, and, if not from discarded seed, were probably planted. Several varieties have been planted in the restored Bush Farm orchard.

*Malus sylvestris* crab-apple: most of the 'crab-apple' trees in hedgerows have leaves and small fruit nearer to this species than to the domestic apple.

*Malus domestica* apple: at least one tree has been identified in a hedgerow. On Barn Hill it grows in grassland and on light scrub, though the relative proportions of this species and of crab-apple has not been determined. A number of old varieties, considered to have been formerly grown in Middlesex orchards, have been planted in the restored orchard at Bush Farm.

*Sorbus aucuparia* rowan: probably increasing in woodland on Barn Hill. Occasional elsewhere, and some trees are known to have been planted.

*Sorbus intermedia* agg. Swedish whitebeam: at least one young tree has been located in the Barn Hill woodland.

*Sorbus aria* whitebeam: a number of young trees occur in the scrub on Barn Hill.

*Sorbus torminalis* wild service tree: found in four hedgerows, including one as a standard tree. A fifth tree has grown in grassland/scrub and has produced suckers. Despite low germination, some young trees have been grown from seed as part of a project by Barn Hill Conservation Group volunteers.

*Cotoneaster* probably *C. simonsii* Himalayan cotoneaster: occasional under scrub from seeds voided by birds.

*Pyracantha coccinea* firethorn: planted in hedges adjacent to Broadview, a road on the north of the Park.

*Mespilus germanica* medlar: planted during the early 1990s as a single plant in the collection at the Bush Farm orchard.

*Crataegus* × *persimilis* broad-leaved cockspur thorn: naturalized in scrub and light woodland, particularly at Summers Croft and Little Cowlays, presumably from bird-sown seed from roadside trees. The parent trees had been planted on the Fryent Way verges, but occasionally sucker at the base and provide evidence of having been grafted onto *C. monogyna* or *C.* × *macrocarpa* rootstock.

*Crataegus monogyna* hawthorn: common in scrub and hedgerows, but less so than *C.* × *macrocarpa*, the hybrid hawthorn.

*Crataegus* × *macrocarpa* = *C. monogyna* × *C. laevigata*: abundant in scrub, light woodland and in hedgerows. More common than either of the two parent species. The range of trees covers the spectrum of intermediacy between that of the parent species. See Williams (1989) for notes on the distribution of the hybrid and the parent species in Middlesex hedgerows.

*Crataegus laevigata* Midland hawthorn: occasional in old hedgerows.

*Robinia pseudoacacia* false acacia: on Barn Hill, presumed to have been planted.

*Galega officinalis* goat's-rue: frequent, on imported substrates. A large colony has spread from landfill at Summers Croft into the edges of old grassland at Saltcroft.

*Lotus corniculatus* common bird's-foot trefoil: on the grass heath and other grasslands on Barn Hill, but relatively uncommon on the London Clay habitats. It was however introduced during the early 1990s, as seed onto imported topsoil on roadside mounds along Fryent Way, and is now common in that grassland.

*Lotus pedunculatus* greater bird's-foot trefoil: frequent in meadows, more so than *L. corniculatus*.

*Vicia cracca* tufted vetch: frequent in grasslands.

*Vicia hirsuta* hairy tare: common in grasslands, though varies in abundance from year to year, probably in response to climatic effects.

*Vicia tetrasperma* smooth tare: frequent in grasslands, though varies in abundance from year to year.

*Vicia sativa* common vetch: common in grasslands, though varies in abundance from year to year.

*Lathyrus pratensis* meadow vetchling: common in grasslands.

*Lathyrus latifolius* broad-leaved everlasting pea: occasional as a garden escape.

*Melilotus albus* white melilot: rare, casual on the imported substrate of roadside mounds, 1988.

*Melilotus officinalis* ribbed melilot: occasional, casual on imported substrate.

*Medicago lupulina* black medick: on disturbed ground, and imported substrate.

*Trifolium repens* white clover: common in grasslands, though in meadows it is now largely restricted to the mown footpaths.

*Trifolium hybridum* alsike clover: occasional in meadows and other grasslands.

*Trifolium dubium* lesser trefoil: in meadows and grasslands, but appears to be declining due to competition from tall grasses. Varies in abundance from year to year, possibly in response to climatic effects.

*Trifolium pratense* red clover: common in grasslands.

*Lupinus* × *regalis* Russell lupin: occasional as a garden escape.

*Laburnum anagyroides* laburnum: occasional, though possibly planted.

*Cytisus scoparius* broom: occasional on the grass heath of Barn Hill. Elsewhere in the Country Park, the shrub is certainly of planted origin.

*Ulex europaeus* gorse: occasional on the grass heath of Barn Hill. Transplants from gardens are known elsewhere in the Country Park.

*Myriophyllum aquaticum* parrot's-feather: spread rapidly in Gotfords pond in the early 1990s and presumably introduced.

*Lythrum salicaria* purple loosestrife: on bank by Richards pond, first recorded in 1994. Origin unknown.

*Epilobium hirsutum* great willowherb: common on seasonally waterlogged soils, ditch sides and rough grassland.

*Epilobium parviflorum* hoary willowherb: rare, in a meadow following disturbance to the ground.

*Epilobium montanum* broad-leaved willowherb: occasional in woodland.

*Epilobium tetragonum* square-stalked willowherb: occasional in rough grasslands.

*Epilobium ciliatum* American willowherb: common in rough grassland and on disturbed ground. Much more common than the broad-leaved willowherb.

*Chamerion angustifolium* rosebay willowherb: common in rough grassland, on disturbed ground and following fires.

*Oenothera glazioviana* large-flowered evening primrose: occasional as a casual on disturbed ground on, or near to, imported substrate, and near to gardens.

*Oenothera cambrica* small-flowered evening primrose: one record in 1988 on disturbed ground following waste tipping.

*Circaea lutetiana* enchanter's nightshade: occasional in woodland and scrub.

*Cornus sanguinea* dogwood: occurs particularly in the older hedgerows. During the 1980s some non-local plants were used to restore other hedges, and on occasion the nursery stock was found to be of the white-fruited dogwoods.

*Euonymus europaeus* spindle: two plants have been recorded, both in old hedgerows.

*Ilex aquifolium* holly: in woodland, mainly from seed voided by birds. Occasionally planted.

*Mercurialis perennis* dog's mercury: there are a few colonies in hedgerows in the south-east of the Country Park.

*Euphorbia helioscopia* sun spurge: on disturbed ground generally on or near to imported substrate.

*Euphorbia lathyris* caper spurge: as a garden escape.

*Euphorbia peplus* petty spurge: on disturbed ground.

*Euphorbia* × *pseudovirgata* twiggy spurge: in rough grassland in Eastland on site of former (wartime?) allotments.

*Frangula alnus* alder buckthorn: several shrubs planted and now established in Great Cowlays.

*Aesculus hippocastanum* horse chestnut: planted by Repton in the Barn Hill landscaping. There are some self-sown trees.

*Acer platanoides* Norway maple: introduced at Summers Croft and elsewhere. Some trees have established from seed.

*Acer cappadocicum* Cappadocian maple: introduced at Summers Croft some time before 1983.

*Acer campestre* field maple: frequent in hedgerows.

*Acer pseudoplatanus* sycamore: a small number of trees were planted in about 1793 by Repton towards the summit of his Barn Hill landscaping. One of these still stands by the Fishpond and the seeds have germinated over large areas, particularly in the immediate vicinity and on the slope downhill. By the early 1980s sycamores were rapidly forming a canopy over large areas of oak and elm scrub, but have since been controlled by repeated cutting and pulling of seedlings. This species and an ornamental variety have also been introduced elsewhere in the Country Park, at various times during the second half of the twentieth century.

*Acer saccharinum* silver maple: planted in Little Cowlays, probably in the 1970s, as isolated trees amongst other introduced maples.

*Acer negundo* ashleaf maple: introduced to Summers Croft on site of former prefabs.

*Oxalis debilis* large-flowered pink sorrel: on soil in car park, 1985.

*Geranium pratense* meadow cranesbill: occasional, and probably as a garden escape.

*Geranium dissectum* cut-leaved cranesbill: common in hay meadows and in other grasslands, though it varies in abundance from year to year.

*Geranium robertianum* herb Robert: in woodland, scrub and hedgerows.

*Geranium phaeum* dusky cranesbill: casual; one plant on disturbed ground in the vicinity of waste tipping, 1990.

*Impatiens glandulifera* Indian balsam: at Little Hillcroach pond. Introduced.

*Hedera helix* ivy: common in hedgerows and woodlands.

*Anthriscus sylvestris* cow parsley: abundant in hedgerow edges and woodland.

*Conopodium majus* pignut: frequent in old woodland and adjacent grasslands on Barn Hill and in the Cowlays area.

*Pimpinella saxifraga* burnet saxifrage: frequent in old grassland, Saltcroft, Barn Hill.

*Aegopodium podagraria* ground elder: naturalized as a garden throw-out at Great Cowlays and adjacent to Fryent Way car park, but apparently absent from much of the Country Park.

*Aethusa cynapium* fool's parsley: occasional on disturbed ground, usually in the vicinity of imported substrate.

*Foeniculum vulgare* fennel: on disturbed ground in the vicinity of imported substrate, 1987.

*Silaum silaus* pepper saxifrage: on old grassland, Saltcroft, Barn Hill.

*Conium maculatum* hemlock: probably as an introduction on imported substrates and then establishing in ditch sides near to roads and in hedgerows.

*Apium nodiflorum* fool's watercress: in a new pond at Little Hillcroach, possibly as an introduction, but origin unknown.

*Sison amomum* stone parsley: frequent in some hedgerows and adjacent grasslands.

*Angelica sylvestris* wild angelica: Little Hillcroach pond, probably introduced.

*Heracleum sphondylium* hogweed: common in hedgerows and in some grasslands.

*Daucus carota* wild carrot: occasional in grassland following ground disturbance in the vicinity of waste tipping.

*Vinca major* greater periwinkle: established as a garden throw-out.

*Hyoscyamus niger* henbane: one plant on roadside mound in 1992, on soil disturbed and/or deposited in 1991.

*Physalis alkekengi* Japanese lantern: on bank of Warrens pond for several years, *c.*1990.

*Physalis philadelphica* physalis: one plant, by wooden bollards adjacent to road at Barn Hill, 1988.

*Lycopersicon esculentum* tomato: at Fryent Way car park, 1985 and 1992.

*Solanum nigrum* black nightshade: occasional on disturbed ground.

*Solanum dulcamara* bittersweet: frequent in hedgerows and by ponds.

*Convolvulus arvensis* field bindweed: frequent in rough grassland and similar habitats.

*Calystegia sepium* hedge bindweed: frequent.

*Calystegia silvatica* large bindweed: common by roadsides and on rough grassland.

*Menyanthes trifoliata* bogbean: introduced, but established at Little Hillcroach pond.

*Nymphoides peltata* fringed water lily: introduced and well established in the Fishpond.

*Pulmonaria officinalis* lungwort: garden escape or possible introduction.

*Symphytum officinale* common comfrey: occasional as a garden throw-out.

*Symphytum* × *uplandicum* Russian comfrey: frequent on the imported substrate of roadside mounds.

*Symphytum orientale* white comfrey: occasional on the imported substrate of roadside mounds.

*Pentaglottis sempervirens* green alkanet: in a hedgerow, possibly introduced with waste material, and as a garden escape.

*Myosotis sylvatica* wood forget-me-not: as a garden throw-out or escape.

*Myosotis arvensis* field forget-me-not: occasional, usually on disturbed ground.

*Stachys officinalis* betony: in old grassland and woodland edge, Saltcroft, Barn Hill.

*Stachys sylvatica* hedge woundwort: common in hedgerows, scrub and light woodland.

*Stachys palustris* marsh woundwort: on banks of a new pond. Origin unknown, but possibly from introduced seed.

*Ballota nigra* black horehound: frequent on roadside banks and in rough grassland.

*Lamiastrum galeobdolon* yellow archangel: naturalized garden escape.

*Lamium album* white dead-nettle: frequent.

*Lamium maculatum* spotted dead-nettle: introduced, on disturbed ground in car park.

*Lamium purpureum* red dead-nettle: frequent.

*Galeopsis tetrahit* common hemp-nettle: occasional.

*Ajuga reptans* bugle: in damp grassland and woodland.

*Glechoma hederacea* ground ivy: occasional.

*Prunella vulgaris* selfheal: in grassland.

*Lycopus europaeus* gypsywort: introduced in ditch from seed from the Brent Reservoir.

*Mentha arvensis* corn mint: occasional.

*Mentha* × *smithiana* tall mint: garden throw-out or escape, Great Cowlays.

*Mentha aquatica* water mint: in ponds.

*Mentha spicata* spearmint: rough grassland, Honey Slough West.

*Hippuris vulgaris* mare's tail: probably introduced into ponds.

*Callitriche stagnalis* common water starwort: in ponds and a ditch.

*Callitriche hamulata* intermediate water starwort: in ponds.

*Plantago major* greater plantain: common in short grassland and on mown paths.

*Plantago lanceolata* ribwort plantain: frequent in grasslands.

*Buddleja davidii* butterfly bush: as garden escape or introduction.

*Forsythia* × *intermedia* forsythia: one plant in scrub, presumed planted, at former tennis/sports club at Lower Hydes.

*Fraxinus excelsior* ash: abundant. Occurs in hedgerows, and planted by Humphry Repton in the landscaped belts to the north and east of Barn Hill, and in new woodlands during the 1980s.

*Syringa vulgaris* lilac: Summers Croft and probably of planted origin.

*Ligustrum vulgare* wild privet: in a small number of old hedgerows.

*Ligustrum ovalifolium* garden privet: most, if not all shrubs have been planted.

*Verbascum thapsus* great mullein: occasional on former tennis court, rough grassland and roadside mounds.

*Scrophularia nodosa* common figwort: occasional in damp, rough grassland.

*Antirrhinum majus* snapdragon: on disturbed ground following waste tipping.

*Linaria vulgaris* common toadflax: occasional in rough grassland.

*Linaria purpurea* purple toadflax: on disturbed ground following waste tipping, 1988.

*Digitalis purpurea* foxglove: frequent in hedgerows, scrub and rough grassland.

*Veronica arvensis* wall speedwell: at edge of horse-grazed grassland.

*Veronica persica* common field speedwell: frequent.

*Veronica hederifolia* ivy-leaved speedwell: amongst willowherb by Little Hillcroach pond.

*Campanula trachelium* nettle-leaved bellflower: one plant in a hedgerow, 1994 and probably earlier. This hedgerow was used for waste tipping during a traveller occupation in 1986–90, which may explain the origin of this plant.

*Lobelia erinus* garden lobelia: on disturbed ground following waste tipping, 1987.

*Galium verum* lady's bedstraw: in old grassland on Barn Hill, 1982, and on roadside verge at Barn Hill, 1989.

*Galium aparine* cleavers: abundant in hedgerows, coppiced woodland, scrub, rough grassland and some meadows.

*Sambucus nigra* elder: common in hedgerows, scrub and woodland.

*Viburnum opulus* guelder rose: planted in light woodland.

*Symphoricarpos albus* snowberry: naturalized in some hedgerows.

*Lonicera periclymenum* honeysuckle: in scrub on Barn Hill.

*Dipsacus fullonum* wild teasel: in rough grassland and on roadside mounds.

*Succisa pratensis* devil's bit scabious: confined to grasslands on Barn Hill, mainly in Saltcroft.

*Arctium minus* lesser burdock: frequent in rough grassland.

*Carduus crispus* welted thistle: on the imported substrate of roadside mounds, 1988.

*Cirsium vulgare* spear thistle: frequent in rough grassland. Some plants occur in meadows.

*Cirsium palustre* marsh thistle: damp grassland in Saltcroft, Barn Hill. Also in grassland at Richards field following ground disturbance.

*Cirsium arvense* creeping thistle: abundant in grasslands, hedgerows and woodlands. It has increased in abundance in meadows following ground disturbance due to a traveller occupation from 1986–90. Such grasslands then require several cuts per year before the creeping thistle can be reduced sufficiently to produce acceptable hay. In undisturbed meadows a single cut per year is usually sufficient to prevent the species spreading. However, where cutting has ceased the creeping thistle has spread quickly.

*Centaurea nigra* common knapweed: frequent in old grassland on Barn Hill, and occasional elsewhere.

*Lapsana communis* nipplewort: frequent on disturbed ground and in rough grassland.

*Hypochaeris radicata* cat's-ear: abundant in mown grassland on the slopes of Barn Hill, common elsewhere on Barn Hill, but largely avoids the taller sward of the hay meadows.

*Leontodon autumnalis* autumn hawkbit: common in grasslands on Barn Hill, frequent in some other grasslands.

*Picris echioides* bristly oxtongue: frequent in rough grassland and in meadows.

*Tragopogon pratensis* goat's-beard: frequent in hay meadows and other grasslands.

*Tragopogon porrifolius* salsify: recorded in hay meadows since at least 1982. Its origin is not known, though it was first noticed near to allotments, and appears to be spreading.

*Sonchus arvensis* perennial sowthistle: in rough grassland.

*Sonchus oleraceus* smooth sowthistle: in rough grassland.

*Sonchus asper*: frequent in rough grassland and on disturbed ground.

*Lactuca serriola* prickly lettuce: frequent in rough grassland.

*Cicerbita macrophylla* common blue sowthistle: at edge of car park, 1984.

*Taraxacum officinale* agg. dandelions: common in the shorter grasslands.

*Crepis capillaris* smooth hawksbeard: in grassland on disturbed ground.

*Crepis vesicaria* beaked hawksbeard: in grasslands and field edges near to Bush Farm.

*Pilosella officinarum* mouse-ear hawkweed: in grass heath at Coneyvale, Barn Hill.

*Hieracium sabaudum* hawkweed: on grass heath at Coneyvale, Barn Hill, particularly where oak scrub has been coppiced.

*Gnaphalium uliginosum* marsh cudweed: on the exposed mud of ponds, and on some paths.

*Pulicaria dysenterica* common fleabane: on disturbed ground, 1994 and 1995.

*Solidago canadensis* Canadian golden rod: naturalized on ditch sides and in grassland.

*Aster* × *versicolor* late Michaelmas daisy: occasional in Great Cowlays amongst a large area of Michaelmas daisies, mainly of *A.* × *salignus.*

*Aster novi-belgii* confused Michaelmas daisy: occasional, adjacent to Summers Croft on clay-capped landfill, amongst other Michaelmas daisies mainly of *A.* × *salignus.*

*Aster* × *salignus* common Michaelmas daisy: abundant, particularly in the Beane Hill and Cowlays area, but also naturalized on disturbed ground, in rough grasslands and hedgerows throughout the Country Park.

*Conyza canadensis* Canadian fleabane: on disturbed ground.

*Bellis perennis* daisy: common on mown grassland, but largely absent from the hay meadows and rough grasslands.

*Tanacetum parthenium* feverfew: naturalized on hedge banks, rough grassland and on disturbed ground.

*Tanacetum vulgare* tansy: rare.

*Artemisia vulgaris* mugwort: common.

*Achillea ptarmica* sneezewort: a few plants occur in old grassland at Saltcroft, Barn Hill, and in a hedgerow ditch.

*Achillea millefolium* yarrow: common.

*Leucanthemum vulgare*: oxeye daisy: occasional, probably occurring as an introduction. Where it has occurred on disturbed ground, it has been in the vicinity of waste material. Otherwise absent from the hay meadows.

*Leucanthemum* × *superbum* Shasta daisy: occurs as a garden throw-out and on disturbed ground following waste tipping.

*Matricaria recutita* scented mayweed: frequent on disturbed ground.

*Matricaria discoidea* pineapple weed: frequent on disturbed ground and paths.

*Tripleurospermum inodorum* scentless mayweed: frequent on disturbed ground.

*Senecio jacobaea* common ragwort: common.

*Senecio erucifolius* hoary ragwort: common and in grasslands.

*Senecio squalidus* Oxford ragwort: frequent on disturbed ground.

*Senecio vulgaris* groundsel: frequent on disturbed ground.

*Senecio sylvaticus* heath groundsel: frequent on grass heath, in woodland and on hedgebanks.

*Senecio viscosus* sticky groundsel: many plants on disturbed ground in 1995, following the importation of topsoil by contractors to London Underground Limited.

*Tussilago farfara* coltsfoot: frequent.

*Calendula officinalis* pot marigold: on disturbed ground in the vicinity of waste tipping.

*Galinsoga quadriradiata* shaggy soldier: on disturbed ground in the vicinity of waste tipping.

*Bidens cernua* nodding bur marigold: Fishpond, Barn Hill.

*Bidens tripartita* trifid bur marigold: common in ponds.

## LILIIDAE

*Butomus umbellatus* flowering rush: introduced, probably from a garden pond in 1987, but did not become established.

*Alisma plantago-aquatica* water plantain: frequent, in the margins of ponds.

*Alisma lanceolatum* narrow-leaved water plantain: one plant, in a seasonal puddle, 1994.

*Elodea canadensis* Canadian waterweed: occasional in ponds; though *E. nuttallii* is the usual waterweed present.

*Elodea nuttallii* Nuttall's waterweed: common in ponds.

*Potamogeton natans* broad-leaved pondweed: frequent in ponds.

*Potamogeton crispus* curled pondweed: frequent in ponds.

*Acorus calamus* sweet flag: first noticed amongst other vegetation when it flowered in the Fishpond on Barn Hill in 1989. Introduced.

*Arum maculatum* lords and ladies: common in hedgerows.

*Lemna minor* common duckweed: common in ponds.

*Lemna trisulca* ivy-leaved duckweed: frequent in ponds, but first recorded only in 1987.

*Lemna minuta* least duckweed: occasional, but confirmed from only one pond.

*Juncus bufonius* toad rush: frequent, in pond margins and on exposed soil of paths.

*Juncus articulatus* jointed rush: frequent in pond margins.

*Juncus inflexus* hard rush: frequent in ponds and in wet grassland.

*Juncus effusus* soft rush: common in ponds and in wet grassland.

*Juncus conglomeratus* compact rush: common in ponds and grasslands.

*Luzula campestris* field woodrush: frequent on old grasslands on Barn Hill, and associated scrub and coppiced woodland. There are no records from grasslands elsewhere in the Country Park.

*Cyperus longus* galingale: occurs in ponds from introduced material.

*Carex otrubae* false fox sedge: frequent in pond margins. Also in some grasslands.

*Carex spicata* spiked sedge: occasional in hay meadows.

*Carex ovalis* oval sedge: rare, but possibly under recorded, in mown grass heath on Barn Hill.

*Carex hirta* hairy sedge: common in grasslands.

*Carex pseudocyperus* Cyperus sedge: in a hedgerow ditch, though probably introduced as seed.

*Carex pendula* pendulous sedge: occasional on ditch and stream sides.

*Carex sylvatica* wood sedge: rare, on hedgebank and path-side on Barn Hill.

*Carex flacca* glaucous sedge: occasional in old grasslands at Saltcroft, Barn Hill.

*Milium effusum* wood millet: occasional, in woodland/hedgebanks, Barn Hill.

*Festuca pratensis* meadow fescue: frequent in some hay meadows and on Barn Hill.

*Festuca arundinacea* tall fescue: occasional in hay meadows.

*Festuca gigantea* giant fescue: recorded on a Barn Hill woodbank, 1991.

*Festuca rubra* red fescue: abundant on the grass heath and other grasslands on Barn Hill, common in some hay meadows below Barn Hill, but occasional and often absent from other grasslands.

× *Festulolium loliaceum* = *Festuca pratensis* × *Lolium perenne*: in grassland at Saltcroft, Barn Hill, 1988.

*Lolium perenne* perennial ryegrass: abundant in reseeded recreational and amenity grasslands, common but declining in the hay meadows, and only occasional in some rough grasslands.

*Lolium multiflorum* Italian ryegrass: occasional in hay meadows.

*Cynosurus cristatus* crested dogstail: common in hay meadows and some other grasslands.

*Poa annua* annual meadow-grass: common on mown grasslands and paths, though practically absent from the taller hay meadow and rough grasslands.

*Poa trivialis* rough meadow-grass: abundant in hay meadows.

*Poa pratensis* smooth meadow-grass: common in hay meadows.

*Poa nemoralis* wood meadow-grass: occasional on woodland/hedgebanks, Barn Hill.

*Dactylis glomerata* cocksfoot: common in grasslands.

*Glyceria maxima*, but only as var. *variegata*: introduced during the 1980s from a garden pond to the Fishpond on Barn Hill where it is invasive.

*Glyceria fluitans* floating sweet-grass: frequent in ponds.

*Glyceria declinata* small sweet-grass: in margins of the Fishpond, Barn Hill.

*Arrhenatherum elatius* false oat-grass: abundant in grasslands. It is the dominant species over much of the hay meadows.

*Avena fatua* wild oat: occasional, roadside.

*Trisetum flavescens* yellow oat-grass: occasional in grasslands.

*Deschampsia cespitosa* tufted hair-grass: common in hay meadows, ditches and rough grassland.

*Holcus lanatus* Yorkshire fog: abundant in grasslands and hay meadows.

*Holcus mollis* creeping soft-grass: frequent in grasslands on Barn Hill and in some hay meadows.

*Aira praecox* early hair-grass: frequent, but confined to the grass heath on Barn Hill.

*Anthoxanthum odoratum* sweet vernal grass: frequent, but only recorded from a few sites on Barn Hill and a small number of hay meadows.

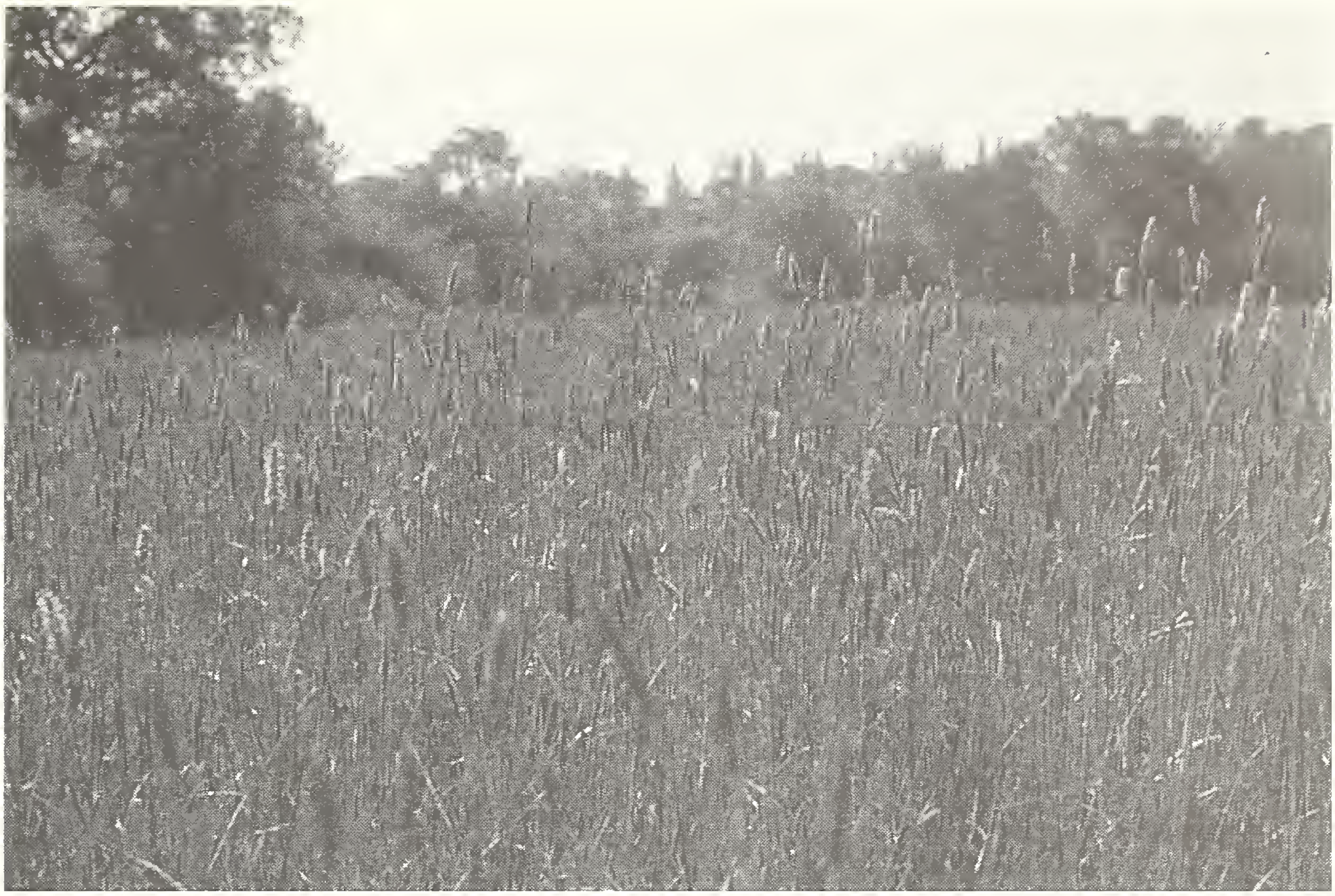

FIGURE 5. *Alopecurus pratensis*, Fryent Country Park. *Photo: L. R. Williams*

*Phalaris arundinacea* reed canary grass: introduced to ponds.

*Phalaris canariensis* canary grass: occasional, on disturbed ground, usually in the vicinity of imported substrate.

*Agrostis capillaris* common bent: abundant in the grass heath of Barn Hill.

*Agrostis gigantea* black bent: identified, but distribution not recorded.

*Agrostis stolonifera* creeping bent: common in grasslands.

*Calamagrostis epigejos* wood small-reed: a single colony occurs in a hedgerow in the north of the Park, but has required frequent management to prevent overshading by encroaching blackthorn.

*Alopecurus pratensis* meadow foxtail: abundant in hay meadows (Figure 5).

*Alopecurus geniculatus* marsh foxtail: common in ditches, pond margins and some grasslands.

*Phleum pratense* timothy: frequent in grasslands.

*Phleum bertolonii* smaller cat's-tail: abundant in hay meadows.

*Bromus commutatus* meadow brome: abundant in hay meadows where it is encouraged by a single, annual cut and harvest each summer.

*Bromus hordeaceus* soft brome: common in hay meadows, but much less common than *B. commutatus.*

*Bromopsis ramosa* hairy brome: occasional in the woodland belt on the northern boundary of Barn Hill.

*Anisantha sterilis* barren brome: frequent on hedgebanks.

*Ceratochloa carinata* Californian brome: by mound in Fryent Way car park in 1992. The species was present until at least 1995.

*Brachypodium sylvaticum* false brome: occasional in the woodland belt on the northern boundary of Barn Hill.

*Elytrigia repens* common couch: abundant in hay meadows and other grasslands.

*Hordeum distichon* two-rowed barley: on roadside mounds on imported substrate, 1987.

*Hordeum murinum* wall barley: common on rough ground, for example on roadsides and at Bush Farm, but largely absent from the more natural habitats of the Park.

*Hordeum secalinum* meadow barley: common in hay meadows.

*Triticum aestivum* bread wheat: one plant, on mound by car park, 1986.

*Phragmites australis* common reed: introduced and established in Little Hillcroach pond.

*Sparganium erectum* branched bur-reed: frequent in several ponds.

*Typha latifolia* bulrush: introduced in the mid 1980s to two ponds from the Brent Reservoir. At Great Hydes pond it had colonized over half of the pond area within six years. Plants have also colonized other ponds, probably as a result of wind dispersal.

*Typha angustifolia* lesser bulrush: introduced in the mid 1980s to the Fishpond on Barn Hill. It has spread rapidly and provides cover for nesting moorhens. Requires annual control.

*Tulipa gesneriana* garden tulip: apparently planted, perversely at the base of trees in mature scrub, throughout Barn Hill, *circa* early 1990s and persisting.

*Polygonatum* × *hybridum* garden Solomon's seal: garden throw-out at rear of gardens, mid 1980s.

*Ornithogalum angustifolium* star of Bethlehem: in a hay meadow, 1987, and where it was almost certainly planted.

*Ornithogalum nutans* drooping star of Bethlehem: two plants in light scrub, Barn Hill, early 1980s.

*Hyacinthoides non-scripta* bluebell: common in hedgerows and on woodbanks.

*Hyacinthoides non-scripta* × *H. hispanica*: frequent, in the vicinity of gardens, for example in scrub and rough grasslands. In these situations it is more common than *H. non-scripta*. Colonization and planting into hedgerows is suspected.

*Hyacinthoides hispanica* Spanish bluebell: occasional in the vicinity of gardens. An individual plant was found on a hedgebank, near to large colonies of *H. non-scripta.*

*Allium schoenoprasum* chives: in rough grassland/disturbed soil adjacent to gardens.

*Allium vineale* wild onion: a colony occurs in rough grassland and hay meadow at Half Yardes Meade.

*Leucojum aestivum* summer snowflake: one plant, by car parking bay, 1985.

*Galanthus nivalis* snowdrop: in hedgerow adjacent to gardens.

*Narcissus pseudonarcissus* daffodil: probably represented by three main sources of introduction. As a wild flower it has been introduced to one hay meadow, but the number of plants is small. More prominently, the tens of thousands of bulbs of larger-flowered cultivars on the roadside verges and mounds along Fryent Way were donated and planted by local volunteers during the early 1990s. Similarly, daffodils are frequent in the vicinity of gardens and as plantings at various sites throughout the Park.

*Asparagus officinalis* asparagus: frequent, if scattered, in rough grassland and hay meadows.

*Ruscus aculeatus* butcher's-broom: a young bush, first noticed as a seedling, has grown for several years under scrub at Saltcroft, Barn Hill, where it is unlikely to have been planted.

*Iris pseudacorus* yellow iris: common by ponds, in ditches and occasionally in grassland. The distribution of this species within the Park has been aided by planting, so it is difficult to judge the extent to which it occurs naturally (Figure 6).

*Crocus vernus* spring crocus: as a garden throw-out in hedgerows near to gardens and in the car park.

*Crocus flavus* yellow crocus: as a garden throw-out in a hedgerow at the car park, 1986.

*Crocosmia* × *crocosmiiflora* montbretia: in rough grassland by gardens, 1980s.

*Tamus communis* black bryony: frequent in hedgerows.

## CHARACEAE

*Chara vulgaris*: in shallow water of a pond on the enlarged ditch north of Gotfords pond, 1988.

## BRYOPHYTA

### HEPATICAE

*Marchantia polymorpha*: in damp grassland.

*Lophocolea bidentata*: common.

*Lophocolea heterophylla*: on decaying bark.

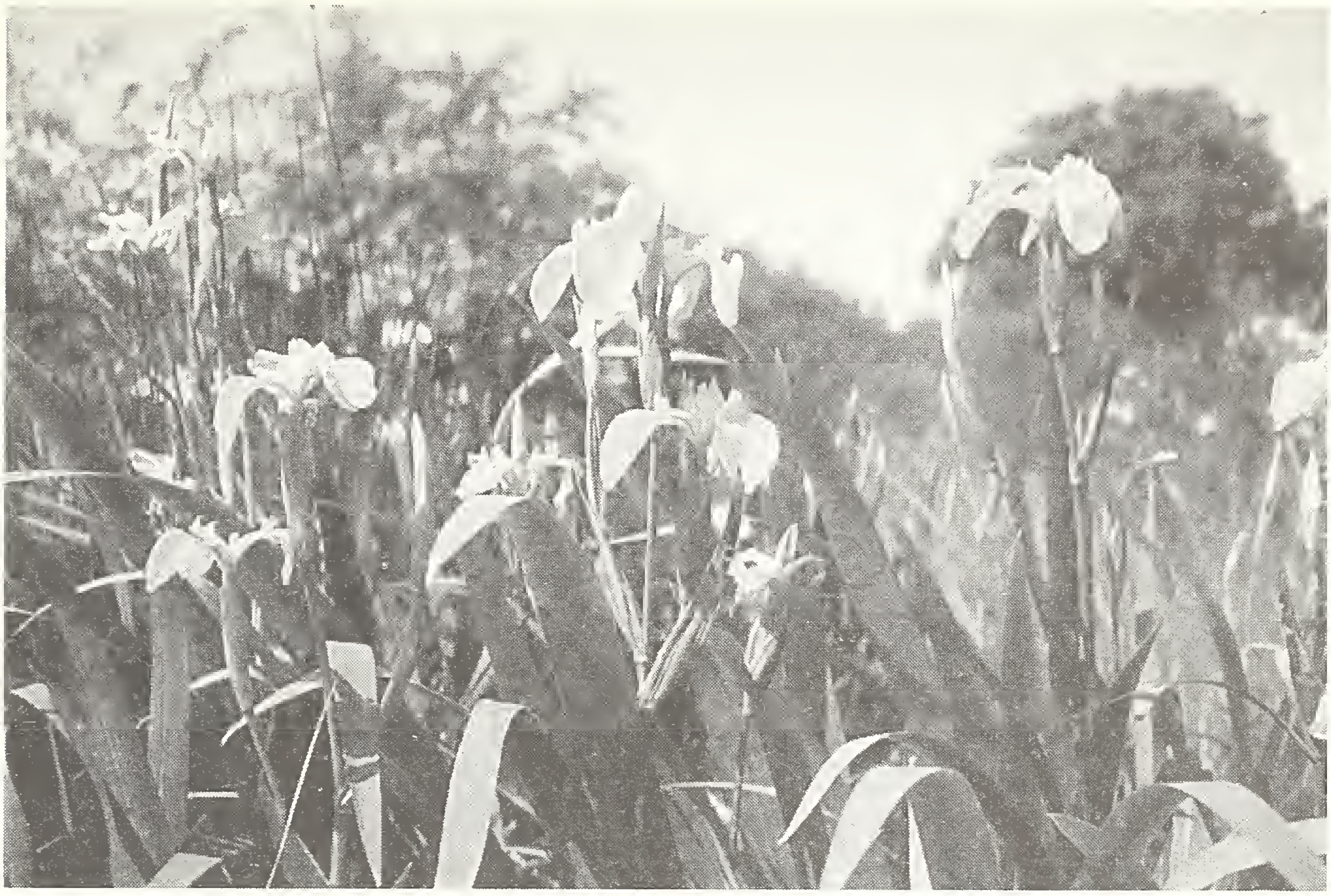

FIGURE 6. *Iris pseudacorus*, Fryent Country Park. *Photo: L. R. Williams*

## MUSCI

*Polytrichum formosum*: on a hedgebank, and in scrub on Barn Hill where it is possibly increasing.

*Polytrichum commune*: several long-established clumps in grass-heath at Coneyvale, Barn Hill.

*Polytrichum juniperinum*: in mown grass-heath, Barn Hill.

*Atrichum undulatum*: on a hedgebank, in rough grassland, and in scrub/coppice in Saltcroft.

*Pseudephemerum nitidum*: ditch, by path, Barn Hill.

*Ceratodon purpureus*: common.

*Dicranella heteromalla*: woodbanks, Barn Hill.

*Dicranoweisia cirrata*: in bark crevices, Barn Hill.

*Dicranum tauricum*: on decaying wood, Barn Hill.

*Campylopus introflexus*: in grass-heath, Barn Hill.

*Fissidens bryoides*: woodbanks, Barn Hill.

*Fissidens exilis*: near to a stream, Preston Eastfield.

*Fissidens taxifolius*: in grasslands at and near to Preston Eastfield.

*Tortula muralis*: on footpath by Preston Eastfield.

*Barbula unguiculata*: on footpath by Preston Eastfield.

*Barbula hornschuchiana*: on footpath by Preston Eastfield.

*Barbula trifaria*: on footpath by Preston Eastfield.

*Barbula tophacea*: on footpath by Preston Eastfield.

*Funaria hygrometrica*: common.

*Orthodontium lineare*: on decaying wood, Barn Hill.

*Pohlia nutans*: frequent.

*Pohlia carnea*: amongst *Lophocolea bidentata*, Barn Hill.

*Bryum capillare*: common.

*Bryum bicolor*: on footpath, Preston Eastfield.

*Bryum gemmiferum*: on gravel at the edge of the Fishpond, Barn Hill.

*Bryum argenteum*: common.

*Bryum rubens*: in rough grassland, Saltcroft.

*Mnium hornum*: in hedgerow.
*Orthotrichum affine*: on willow at Preston Eastfield.
*Orthotrichum diaphanum*: on willow at Preston Eastfield.
*Ulota crispa*: on oak, Barn Hill, 1996.
*Amblystegium serpens*: common.
*Amblystegium riparium*: near to a stream, Preston Eastfield.
*Calliergon cuspidatum*: on mown grassland, Barn Hill.
*Brachythecium rutabulum*: common.
*Brachythecium rivulare*: near to a stream, Preston Eastfield.
*Rhynchostegium confertum*: common.
*Eurhynchium praelongum*: common.
*Hypnum cupressiforme*: common.
*Hypnum cupressiforme* var. *resupinatum*: on trees, Barn Hill.
*Hypnum jutlandicum*: on grass heath, Barn Hill.
*Rhytidiadelphus squarrosus*: Barn Hill.

## Discussion

Despite the urbanization of the surrounding land since the 1920s, the loss of small farmsteads and the cessation of autumn grazing, Fryent Country Park has largely retained its semi-natural landscape. That is a landscape of lowland (Middlesex) farmland on London Clay soils where permanent grassland predominated, of hedged fields and where most fields had access to a pond. Small woodlands and scrub were a feature of this landscape, as were grass-heath on the gravel-capped low hills. The plant communities of these habitats were summarized by Williams and Northcroft (1992) and in other publications reviewed in the Introduction. The naturally occurring species recorded during this survey were predominantly those of lowland grasslands, hedgerows, woodlands and ponds on neutral soils. The exceptions were those species of acid grass heath as found on the slopes and the summit of Barn Hill. Where introductions to the flora have occurred, these have tended to be comparatively recently and their source was often known or can be guessed. This contrasts with the situation in the vicinity of the Brent Reservoir where introductions to the flora have occurred over a period of about 150 years, thus making it difficult to separate the introductions from what remains of the earlier plant communities (Williams, Warren and Hutchinson 1995). For Fryent Country Park the vascular plant species listed above can be divided into approximately 250 species that were probably indigenous to the rural landscape, and approximately 200 species that have been introduced, depending upon the criteria used to describe introductions.

Introductions, in this context, include species that would have reached the site naturally (e.g. *Epilobium ciliatum* American willowherb) and those that have been introduced as a result of human activities. At Fryent Country Park many introductions have occurred during the past fifteen years and were documented during this survey, while other, earlier introductions were obvious from the known landscape history of the Park. Thus the main route of introduction of many species is known or a probable route can be suggested, though some species have reached the Country Park during successive introductions. The earliest introductions were probably as a result of agriculture as the woodland was cleared. At some stage introductions from agricultural activities included planting in farmstead orchards (e.g. *Morus nigra* black mulberry). Humphry Repton introduced several species in his late eighteenth century landscaping on Barn Hill including *Fagus sylvatica* beech, *Castanea sativa* sweet chestnut, *Quercus cerris* Turkey oak, *Carpinus betulus* hornbeam, *Tilia* × *vulgaris* common lime, *Aesculus hippocastanum* horse chestnut and *Acer pseudoplatanus* sycamore. Twentieth century landscaping by local authorities included *Populus nigra* 'Italica' Lombardy poplars in about the 1930s, *Alnus cordata* Italian alder and

*Acer saccharinum* silver maple in the 1970s, and in partnership with the local community, roadside *Narcissus* daffodils in the 1990s. National woodland grant schemes have encouraged the introduction of e.g. *Alnus glutinosa* alder in the 1980s, and, as a result of nursery labelling errors. *Alnus incana* grey alder. Other trees have been introduced in the name of conservation, for example, *Frangula alnus* alder buckthorn, or from willow setts (e.g. *Salix pentandra* bay willow and *S. purpurea* purple willow), or to plant and restore hedgerows (e.g. most of the common species of locally occurring hedgerow trees and shrubs, but including some non-local species such as *Prunus cerasifera* cherry plum), or to restore an orchard (e.g. *Malus domestica* apple varieties). In recent years a high proportion of the planted hedgerow trees, and some of the trees planted in the orchard, have been from seed collected from the Country Park and raised by volunteers in the Barn Hill Conservation Group tree nursery. Trees and shrubs have also established from introduced seed voided by birds (e.g. *Taxus baccata* yew), and from nearby street trees (*Crataegus* × *persimilis* broad-leaved cockspur thorn), and it is possible that *Malus domestica*, where not of planted origin, was introduced by visitors.

A large proportion of introductions, including many casuals, arrive as seeds or rootstock in materials imported to the site. Amongst the introductions in landfill at Summers Croft were *Fallopia japonica* Japanese knotweed and probably *Galega officinalis* goat's-rue. During the late 1980s, large roadside mounds were constructed along both sides of Fryent Way to deter possible unauthorized traveller occupations. Many casuals and other species were introduced amongst the landfill and topsoil materials used in these mounds, including *Potentilla anserina* silverweed, *Melilotus albus* white melilot and *M. officinalis* ribbed melilot. Topsoil is often transported long distances and included casuals such as *Fumaria officinalis* common fumitory and *Senecio viscosus* sticky groundsel. Illegal waste tipping during an occupation by travellers from 1986 to 1990 introduced a large number of casuals to several of the meadows, for which *Papaver somniferum* opium poppy is given as an example. Fly-tipping from private gardens, either over a garden fence or as car-borne tipping, was also a problem and appears to be responsible for many casuals and for the establishment of *Aegopodium podagraria* ground-elder, which does not otherwise occur in the Country Park. Indeed, there is little distinction between illegal fly-tipping, and garden throw-outs, e.g. *Symphytum officinale* common comfrey.

But there are also people who make a conscious effort to plant such rootstock as unsolicited donations in the Park (e.g. *Lavatera thuringiaca* garden tree mallow). Elsewhere, *Tulipa gesneriana* garden tulips have been planted at the base of oak trees in the scrub on Barn Hill. There have been plantings in memory of a family member or friend, e.g. *Ornithogalum angustifolium* star of Bethlehem. Ponds appear to receive many introductions, some 'donated' from private gardens (e.g. *Nymphaea alba* white water lily), while new ponds receive introductions from other local ponds, both on and off site, e.g. *Phragmites australis* common reed and *Typha latifolia* bulrush. Other introductions arrived amongst the rootstock of other introductions, for example *Crassula helmsii* New Zealand pigmyweed amongst water lily. 'Wildflower seed' generally fails to establish in grassland, though it may do better on disturbed ground, as did *Sanguisorba minor* salad burnet introduced by a school, but does not occur naturally in the area and has not been seen for several years. Genuine garden escapes may include *Aquilegia vulgaris* columbine, *Meconopsis cambrica* Welsh poppy, and from a herb garden, *Isatis tinctoria* woad. Finally, there were hybrids between the introduced and the naturally occurring species, as between the bluebells to give *Hyacinthoides non-scripta* × *H. hispanica*.

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# Status of the crested newt *Triturus cristatus* in Greater London in 1995

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## Abstract

This paper reports the results of a resurvey of all known breeding sites of crested newts in Greater London during 1995. It identifies the current distribution of the species and discusses the causes of its decline. A ten-year Conservation Strategy is proposed to halt and reverse the losses by the year 2005.

## Introduction

The crested newt *Triturus cristatus* is the most highly protected amphibian species in Britain. It was listed in the Council of Europe's Berne Convention in 1979 and by the Wildlife & Countryside Act (1981). A European Community Directive 'Habitats & Species' (Annex IIa) provides further protection, including designation of special areas for its conservation. Strict protection has, therefore, been in existence for well over a decade. See Frontispiece.

Much survey work was undertaken nationally after the passing of the Wildlife & Countryside Act, and between 1983 and 1985 a London Pond Survey was carried out by the Fauna & Flora Preservation Society, partly funded by the former Greater London Council.

The London Pond Survey (Langton 1985) was not a specific crested newt survey, but formed a baseline from which to assess any change in status and distribution. The original survey, using a full-time member of staff, also effectively eliminated recorder bias in its coverage.

The current survey was initiated because of evidence of a decline in the total number of ponds in the county, the apparent lack of attention being paid to crested newts by land managers, and an unsubstantiated perception that the species has not been recorded at some sites resulting in them being lost or damaged without the presence of the species being known.

It is believed that the present project is the first in England to resurvey completely all known crested newt colonies over a large area approximating to the county scale. In addition, selected sites not previously recorded were also surveyed for the species.

The results are presented here without individual site data. This confidential information is held by the authors, the London Amphibian & Reptile Group, and Tom Langton, the London Natural History Society's Reptile and Amphibian Recorder.

## Methodology

The objectives of the survey were to obtain an up-to-date statement concerning the status and distribution of all crested newt breeding sites in Greater London, together with investigating any changes in the number of extant colonies or the range of the species. An attempt was also made to note any threats to populations and assess likely reasons for any local extinction in order to predict future trends. Known garden pond introductions were excluded from the survey.

The primary source of information about breeding sites was the data obtained in the London Pond Survey (Langton 1985) which was later updated (Langton 1992). In addition, a desk study was carried out to collate other records not known to Langton (1985, 1992). A letter canvassing new records was circulated to relevant groups and individuals.

A small sample of ponds with no previous records of crested newts was surveyed as a control (approximately two ponds per night) to test for previously undetected newt presence. Many of these sites were located within two kilometres of known colonies. The survey was carried out by the authors visiting all ponds in suitable weather conditions between 22 March and 2 June 1995. Each pond was visited once, except two ponds where conditions on the first night were considered to have affected the survey results.

Torching was the primary survey technique, together with egg searching to prove breeding or where turbid conditions or poor bankside access prevented effective counting. No hand netting, bottle trapping or refugia searching was undertaken. A note was taken of the other amphibian species present at all ponds.

Basic details of each pond were collected, including depth, water clarity, amount of vegetation and shading. A note was also taken of the immediate surrounding terrestrial habitat and any obvious threats to the site. These details were noted after dark and cannot be considered definitive vegetation and habitat data upon which to plan a detailed site management brief.

The data were analysed into high, medium and low status water bodies. A count of 30 + adult newts defined a high category site, while a count of between 10 and 30 formed the medium category, and ponds with less than 10 newts seen were defined as being of low status.

## Survey results

A total of 91 known crested newt water bodies was identified in 1995. The analysis of results is presented by the total number of individual water bodies in view of the difficulty in identifying separate populations and metapopulations when assessing losses. The results are given in Table 1.

Langton (1985) used records from 1975, although some sites may have become extinct before his survey. The present survey shows that crested newts are thought to no longer breed at a minimum of 42 per cent of known individual water bodies in the last twenty years.

The 50 extant water bodies with a confirmed presence of crested newt from the current survey can be divided into four broad status categories (Table 2).

It is clear that many water bodies have only low populations. (A low status was allocated to a pond even if only a single adult was seen.) A number of populations in this category are thought to have ceased recruitment and many have probably gone beyond the point of saving, even with immediate management. It should be noted that a high population status in London represents only a low status in national terms.

TABLE 1. Summary of survey results.

| | |
|---|---|
| Present (Established water body) | 45 |
| Present (Introduction water body) | 5 |
| No access | 3 |
| Probably extinct* | 38 |

*It should be noted, however, that probable extinction was classified solely on the basis of a single year's data and, in cases where the pond remains, this should still be reconfirmed by further survey should any site be the subject of a development application.

TABLE 2. Status of extant crested newt sites.

| **Category** | | **No. of water bodies** |
|---|---|---|
| High | (Count >30) | 12 |
| Medium | (Count 10–30) | 12 |
| Low | (Count <10) | 18 |
| Introduced colony | | 5 |
| Unknown | | 3 |

Contact with landowners during fieldwork revealed that proposals were already in hand for management work at three ponds in May 1995 and August/September 1995, which would have been before all the metamorphs had left the pond and hence an offence under the Wildlife & Countryside Act.

The ownership of the sites has not changed in the past ten years and it cannot be claimed that the owners were not aware of the species.

The results suggest that the Wildlife & Countryside Act and European legislation have not been effective for crested newts in Greater London, given the scale of losses and the apparent lack of awareness about management needs and constraints which are continuing to threaten colonies.

The causes of probable extinction at any given water body are often difficult to assess and, in some cases, the loss may be caused by several factors acting together. A number of factors, however, will obviously affect the survival of any colony and these gross influences were noted during the fieldwork. Analysis of these major factors (Table 3) highlight the principal threats facing crested newt water bodies in the capital.

These figures clearly show that the major causes of decline are a lack of sympathetic management combined with interference through the introduction of fish. The latter problem is particularly prevalent at sites with full public access and at some of the sites used for educational purposes. No colonies were found at water bodies where sticklebacks were present and these appear to cause rapid extinction. Some crested newts were found to survive at a few sites with carp Cyprinidae present.

If the crested newt is to survive in Greater London a proactive approach will be required to promote a better understanding of the ecology of the species and to initiate active management.

The loss of the species at some water bodies, e.g. through the introduction of fish, will be less significant where the individual water body lies within a ‘pond cluster’, from which crested newts can recolonize once the ‘extinction factor’ is removed, e.g. by the drying out of a fish-pond removing the predator.

TABLE 3. Probable factors causing crested newt extinction.

| | |
|---|---|
| Lack of/poor management | 40% |
| Fish present | 32% |
| Site lost | 18% |
| Terrestrial habitat | 13% |
| Not known | 5% |
| Pollution | 3% |
| Disturbance | 3% |

Figures relate to the number of water bodies where each factor was present and do not total 100 per cent because more than one factor was identified at some sites.

TABLE 4. Analysis of populations by pond clusters.

| No. of populations | No. of water bodies |
|---|---|
| 26 | 1 |
| 9 | 2 |
| 2 | 3 |
| Nil | >4 |

The London Pond Survey discovered that only 35 per cent of crested newt sites consisted of single water body sites. Analysis of the current survey results reveals a marked change. The 50 individual water bodies with crested newts, including introductions, can be grouped into 37 distinct populations (Table 4).

Based on current data, the majority of populations (70 per cent) are now within a single water body site. Of the eleven populations with more than one water body, at least seven are in immediate danger of extinction or contraction to a single breeding site.

As well as the need to instigate a comprehensive conservation work programme to overcome the lack of management at many surviving sites, there is also a requirement to lessen the vulnerability of single water body populations through the provision of alternative nearby breeding ponds.

The distribution of crested newts has always been biased towards the eastern half of the county, with major populations in Bromley, Bexley, Havering, Barking & Dagenham, Waltham Forest, and Enfield, together with a secondary stronghold in Hillingdon in the north-west of London (Langton 1991).

The current survey reveals a marked range contraction to the eastern half of the county (arbitrarily defined as east of the National Grid Easting TQ 35) which now holds 35 (70 per cent) of the remaining crested newt water bodies. This pattern is likely to be further enhanced by the anticipated early extinction of the species at four ponds.

Using the London Bat Group's definition of 'Inner London' (boroughs which have no part of their boundary adjoining one of the surrounding counties), only six crested newt water bodies (12 per cent) are situated in 'Inner London' boroughs.

The other 44 water bodies are situated in 'Outer London' boroughs (Table 5). The only 'Outer London' boroughs without known crested newt water bodies are Croydon, Hounslow, Kingston-upon-Thames and Redbridge.

Of the 50 extant water bodies with crested newts, including introductions, only one pond is situated within a Site of Special Scientific Interest (SSSI).

Two water bodies lie within an existing statutory Local Nature Reserve (LNR), and there is a proposal to designate another site as an LNR which will cover a further two water bodies.

A further three sites are nature reserves managed by the London Wildlife Trust, but the colony at one of these sites is now probably extinct.

It is apparent that the crested newt sites which were resurveyed in London are largely unprotected. Only 9 per cent, excluding introduction sites, are within SSSIs and LNRs (4 out of 45 sites). Inclusion within a protected area has, however, been no past guarantee of effective conservation.

Four crested newt water bodies are moats which are designated as being of archaeological interest and are secure from development, although not from losses due to a lack of, or inappropriate, management.

A further five water bodies at four sites relate to introductions which have taken place since 1992.

The final finding of the survey was four new crested newt localities. At two of these, good numbers of adults and ova were found, whilst at the remaining two localities, only ova were discovered. All of these new localities were found

TABLE 5. Distribution of crested newts by London borough.

| **Borough** | **No. of water bodies** | **No. of populations**** |
|---|---|---|
| Bromley | 12 | 8 |
| Havering | 10 | 8 |
| Waltham Forest | 5 | 4 |
| Hillingdon | 5 | 3 |
| Bexley | 4 | 2 |
| Barnet | 3* | 2 |
| Barking & Dagenham | 2 | 1 |
| Enfield | 2 | 2 |
| Ealing | 2 | 2 |
| Greenwich | 1 | 1 |
| Haringey | 1* | 1 |
| Harrow | 1 | 1 |
| Richmond-upon-Thames | 1* | 1 |
| Sutton | 1 | 1 |
| | **Total:** 50 | **Total:** 37 |

* Denotes all water bodies relate to introductions.
**Defined as ponds within 500 metres of each other.

as a result of information received from the widely distributed letter of enquiry. At previously known sites, crested newts were recorded in nine water bodies where they had not earlier been seen.

In conclusion the authors predict from the survey results the following outlook for the species in Greater London:

- ★ significant further losses of up to 50 per cent of both remaining water bodies and populations anticipated by the year 2005.
- ★ an almost complete contraction of range into the eastern half of Greater London.
- ★ Critically low population status at most of the surviving sites.

## Conservation Strategy, 1996–2005

The following Conservation Strategy is based on a reduction in the use of 42 per cent of the water bodies used for breeding by crested newts in London over the past 20 years. In 95 per cent of instances (36 out of 38 cases) the probable reason for abandonment was identified. There is now an urgent need to halt the decline. In view of the past gross lack of attention paid to the needs of the species and its habitats by all parties in London since 1981, there is a long and potentially expensive list of action points required.

The resources required to implement the Strategy will be considerable in terms of time, effort and money. It should be stressed, however, that if this Strategy is not fully resourced, the species will be at risk of extinction in the county, except in core areas which receive direct protection. At the moment it seems that crested newts have survived in spite of, rather than because of, human influence.

Resourcing this Strategy needs to begin in 1996 and continue for the coming decade to halt and reverse past deleterious trends. It cannot be over emphasized that the next ten years is very much the ‘last chance’ for crested newts in much of London. If this Strategy is ignored or under resourced, there can be no surprise at the future loss of the species from the larger part of the county as its needs are now fully documented.

The following Strategy was recommended to English Nature. It can be broken into two main parts. The first deals with surveying and monitoring needs, whilst the second part covers management requirements.

### (i) Survey and monitoring requirements

Attempts should be made to gain access in 1996 to the three sites with no access in the current survey.

All extant populations identified during the 1995 survey should be revisited during the day in 1996 to prepare detailed site briefs, including a vegetation and habitat map and detailed management recommendations. This is considered essential in order to plan management work effectively.

The survey has found crested newts in nine water bodies where they had not previously been documented. It is considered important that the true extent of remaining populations are fully documented. A survey should be undertaken in 1997 to visit all ponds within 1 km of known population/metapopulation ponds during the breeding season and larval metamorphosis period to provide an up-to-date picture of current distribution.

The number of 'new' crested newt water bodies (14 out of the remaining 50 water bodies) found in the current survey is the result of new introductions (5 water bodies), under recording (4 water bodies) and a site record appeal (5 water bodies).

This situation should be addressed by resourcing in 1997 the maintenance of a county herpetofauna database for crested newts managed by the London Amphibian & Reptile Group.

All existing introduction/reintroduction sites should be monitored annually for the next decade to document their development. At the end of the period covered by this Strategy, data relating to all introductions/reintroductions, whether successful or not, should be analysed and a summary of results published.

All ponds subject to practical conservation work under the management programme outlined below should be monitored annually commencing with the breeding season after management in order to document success and propose any futher work required.

A complete resurvey of all crested newt sites should be carried out after ten years to assess the effectiveness of this Strategy and to prepare a new document.

The survey has also highlighted a number of ponds where palmate newts *Triturus helveticus* were previously known but are likely no longer to be present. This species is a rare and vulnerable amphibian in Greater London.

There must be considerable concern that this species could also be 'quietly' lost as a result of the general decline in ponds. In order to avoid the present situation with crested newts repeating itself with palmate newts, all known colonies of the latter species (except those visited in 1995) should be resurveyed in 1998 and similar site briefs prepared.

### (ii) Management requirements

The past lack of management at most sites and the key threats facing remaining colonies have been detailed above. It is apparent that the majority of colonies require some management. As it is obviously not practical to manage all water bodies at once, each site has been placed into either a high, medium or low category for management priority.

The allocation to a particular category has balanced the need to give priority to the most important populations, with the immediacy of any management works needed and any existing threat to a colony. Other factors considered are where ponds were believed to be beyond saving, the need to maintain the range of the species in London, together with the practical aspects of implementing a management programme, such as land ownership, access, long-term future for the site and the resources required to carry out the work.

It will be necessary to resource management at an average of four sites (some with more than one water body) per year for ten years in order to ensure the completion of this programme.

Even with the full resourcing of this programme, it is anticipated that the chances of successful establishment at some introduction sites, together with losses at those colonies now beyond saving, will result in the extinction of crested newts at a further ten water bodies during the course of this Strategy.

It will, therefore, be necessary to provide for one new population per year over the next decade in order just to maintain the existing status of the species. These new ponds should be located in the areas holding the most significant populations or where they are necessary to maintain the range of the species. They should aim to restore ponds which held the species in the past and where it was lost though lack of, or inappropriate, management.

No introductions to sites which did not recently hold crested newts should in future be licensed by English Nature. Such activity is rarely successful and detracts from the key threats facing existing populations. Every effort and all resources must be directed to saving existing colonies and, secondarily, re-establishing the species at former sites.

The survey has illustrated that some landowners may, at best, be unaware of the presence of crested newts using their ponds or, at worst, be ignoring the statutory protection provided for the animals and their habitat.

It is considered essential that all landowners are renotified of the existence of crested newts and provided with basic information about the ecology and needs of the species and encouraged to carry out appropriate management. This circulation should be carried out by the London Amphibian & Reptile Group at the earliest opportunity.

This correspondence, together with the relevant survey data should form the basis of a case-file for each site which can be developed through the addition in 1996 of the habitat survey map and management prescription referred to above. The establishment of individual case-files will be essential in order to coordinate information and implement an effective Conservation Strategy in the county.

The survey has highlighted the past lack of crested newt conservation and the immediate requirement for an on-going management programme to halt declines. Such a programme was first proposed in 1985, but was not considered as a priority for funding by the Greater London Ecology Unit who funded the London Pond Survey. English Nature has been asked for funds in 1996 to implement this Strategy.

To date, no one seems to have been able or capable of a strategic approach to saving this species. It is essential for the future of the crested newts in Greater London that this Strategy does not remain a reference document left in a filing cabinet.

To overcome this potential situation a meeting took place between English Nature (London Team) and the London Amphibian & Reptile Group in October 1995. It was recommended that a London Crested Newt Recovery Group was formed to meet twice yearly and monitor progress towards the implementation of this Strategy.

## Acknowledgements

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Finally, thanks are also due to the many landowners who facilitated the survey by allowing unrestricted access to their properties after dark.

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# A long-term study of a pipistrelle colony in Sutton, Surrey, from 1985 to 1994

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## Abstract

This paper describes the monitoring of a pipistrelle *Pipistrellus pipistrellus* maternity roost in the London Borough of Sutton. Data have been collected for the last ten years, making this the longest-studied pipistrelle roost in Greater London. Numbers of bats, emergence time and duration, and descriptions of behaviour are all recounted, together with comments on the duration of bat occupancy.

## Introduction

Insectivorous bats form segregated groups of females during pregnancy and lactation. These colonies may gather in a single roost site or in several suitable sites within a small area. Several studies have been carried out to investigate roost use in bats, both in the short term (e.g., Maier 1992) and in longer studies spanning years, which have shown that bats exhibit a high level of philopatry and return to the same roost each year to breed (Thompson 1992). This study is one of the most detailed sets of observations made by humans, as opposed to machines, and constitutes an important long-term record of the dynamics of a pipistrelle maternity roost. The full data set is available from the London Bat Group.

## Materials and methods

### Study area

The site is a small close with houses of mixed age and type in the London Borough of Sutton where the rear gardens all run down to a river. The houses used by bats were built around 1959–60. All roosts face south-west, and thus receive a lot of sun on hot summer days.

Counts were carried out by two of the local residents who describe their work as 'very much an amateur effort', but they have produced an impressively detailed record of the roost over the last ten years. Counts were made each evening throughout the duration of the bats' occupancy, where weather permitted.

### Roost descriptions

Four of the houses have been used by a maternity colony of female pipistrelles since around 1985. No. 3 is a semi-detached house whilst Nos. 5, 7 and 9 form a block of houses. The entrances to the roosts at Nos 3, 5 and 9 are all between a tile and the flashing under a window-ledge giving access to short lengths of tiles between two windows. No. 3 is the smallest roost and it receives the most sun. It consists of only three half-tiles and is 48 cm long externally with a long space at the bottom of either end between the tile and the flashing under the window-ledge. The entrance has a wide gap under the tile, but at the other end the gap is very narrow. No. 3 was first used by bats in June 1985, No. 5 in 1986 and No. 7 in 1988. Droppings were first seen at No. 9 in 1983, although counts did not begin until 1985.

### Variables measured

Each evening the occupiers recorded: date of observations, total number of bats, which roost and exit the bats were flying from, time first bat was seen during the evening, time last bat was seen, time count ended, comments on behaviour. Temperature and weather conditions have been recorded since 1988, when it was suggested to the occupiers that these factors may affect bat behaviour.

## Results

### Numbers of bats

The numbers of bats using the roosts has increased since the counts began (Table 1). The numbers peaked in 1992 with 75 bats counted during July; this number included young bats just learning to fly. The 60 bats seen in 1993 was the largest number seen at the beginning of June. The colony now has at least 70 bats using roosts chosen when the group was less than 40.

### Duration of occupancy

Duration of stay is measured from the date the bats were first observed to be using the roost (i.e., leaving or entering), although droppings were often observed around roost entrances prior to this date.

Although the numbers of bats using the roosts has risen, the duration of occupancy has fallen (Table 2 and Figure 1). Bats generally all collect in one roost and remain there for some weeks. When the bats change roosts within the close or leave altogether, this usually occurs over two nights. The bats usually leave the roosts in the close after one or two hot days at the end of June or beginning of July and move on to another roost not yet discovered. In 1992 the bats left No. 5 during the hot weather in early June, but returned on 8 July when the weather was getting colder.

### Young bats

The occupiers describe young bats as ‘fluttery’; flying slower but with faster wing movements. They are seen to crawl on the tiles before launching unsteadily, and to fall almost onto the porch before flying away. Sometimes they remain in front gardens, flying very low and returning to the roost early and in groups even when there were plenty of insects. Young bats departed from the

TABLE 1. Peak numbers of bats recorded over a nine-year period for a colony of pipistrelles in Sutton.

| **Year** | **1986** | **1987** | **1988** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** |
|---|---|---|---|---|---|---|---|---|---|
| Date first seen | 26.v | 8.v | 21.iv | 6.v | 23.iv | 17.v | 6.v | 30.iv | 17.iv |
| Maximum no. of bats | 30 | 32 | 41 | 42 | 52 | 44 | 75 | 60 | 70 |
| Date of peak count | 26.vi | 3.vi | 8.vii | 12.vi | 19.vi | 28.vi | 13.vii | 3.vi | 23.v |

TABLE 2. Duration of roost occupancy and counting effort.

| **Year** | **Duration of stay** | **No. of days** | **No. of counts made** |
|---|---|---|---|
| 1986 | 26.v–2.vii | 38 | 52 |
| 1987 | 8.v–29.vi | 53 | 70 |
| 1988 | 21.iv–15.vii | 86 | 74 |
| 1989 | 6.v–16.vii | 72 | 40 |
| 1990 | 23.iv–27.vi | 65 | 68 |
| 1991 | 17.v–5.vii | 50 | 33 |
| 1992 | 6.v–16.vii | 72 | 39 |
| 1993 | 30.vi–6.vi | 37 | 30 |
| 1994 | 17.iv–17.vi | 62 | 51 |

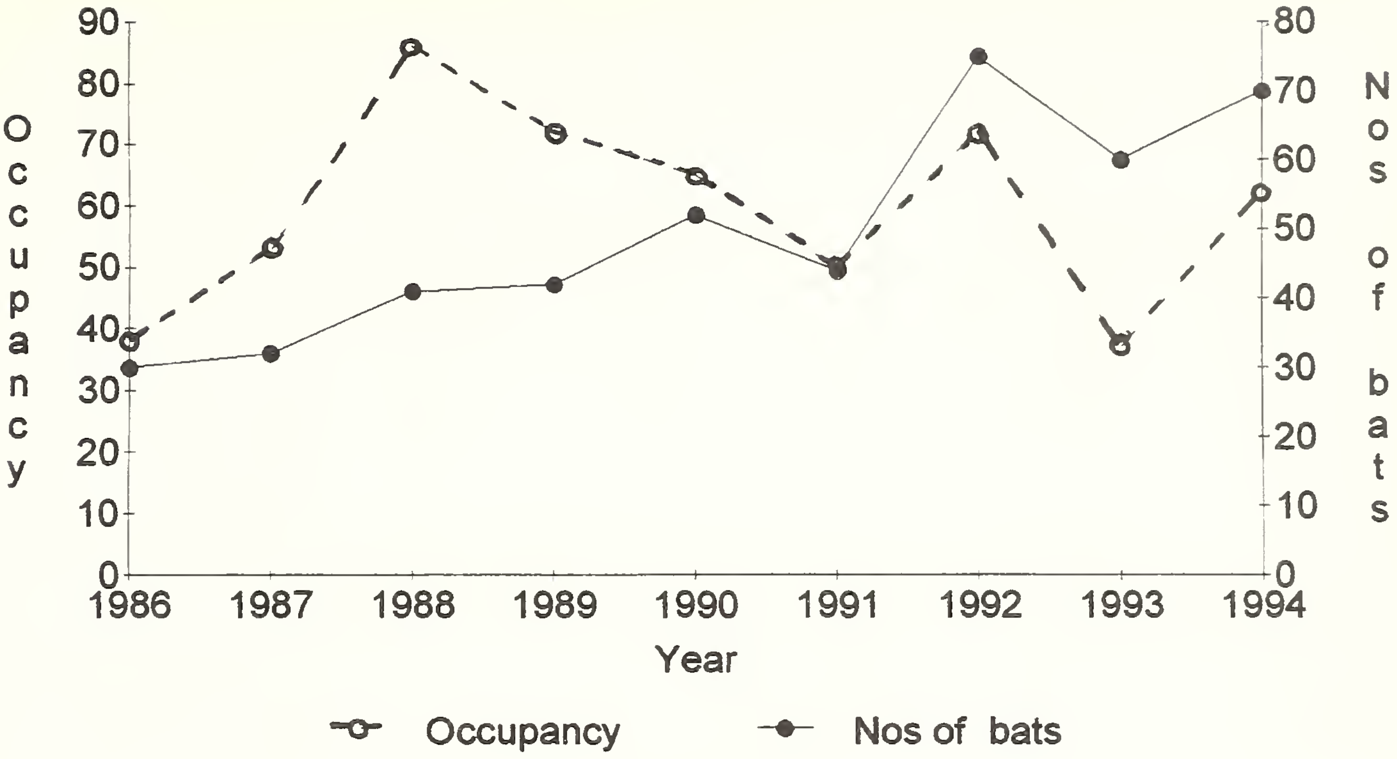

FIGURE 1. Numbers of bats against duration of colony occupancy.

TABLE 3. Relationship between date young are first seen and emergence duration.

| **Year** | **Date young first seen** | **Emergence duration** (min) | **Mean duration** (min) |
|---|---|---|---|
| 1986 | na | na | na |
| 1987 | na | na | na |
| 1988 | 29.vi | 58 | 30 |
| 1989 | na | na | 19 |
| 1990 | na | na | 19 |
| 1991 | 28.vi | 108 | 19 |
| 1992 | 8.vii | 73 | 27 |
| 1993 | na | na | 29 |
| 1994 | 26.v | 66 | 28 |

roost later in the evening than their mothers, often up to about 22.45. This results in long emergence durations, for example bats took an hour or more to come out in the beginning of July 1988 (Table 3).

### Temperature

Bats were noted to be noisier and more active in the roost on hot days, but did not necessarily leave the roost earlier in the evening since emergence time correlates only with sunset (Table 4).

### Emergence duration

This measure of the time taken for the colony to leave the roost was calculated from the records of the first and last bats seen to emerge each evening (Table 4). It is unlikely that all the bats left the roost each night, and noises (vocalizations and sounds of movement) could often be heard from the roost when the count had finished.

### Interval between sunset and emergence

This was calculated using the time of sunset (*Whitaker's Almanac*, 1994) and of the first bat appearing each evening. Many pre-sunset emergence times (e.g.,

TABLE 4. Selected data from 1994 counts showing relationship between emergence, sunset and temperature.

| Date | Total numbers of bats | Time taken for bats to leave roost (mins) | Time of first bat | Time of sunset | Time difference (mins) | Temperature °C |
|---|---|---|---|---|---|---|
| 24.iv | 20 | 17 | 20.23 | 20.12 | 11 | 11 |
| 1.v | 57 | 20 | 20.35 | 20.24 | 11 | 12 |
| 8.v | 49 | 18 | 20.50 | 20.35 | 15 | 9 |
| 16.v | 60 | 18 | 21.01 | 20.46 | 15 | 11 |
| 22.v | 70 | 36 | 20.50 | 20.56 | − 6 | 12 |
| 29.v | 60 | 32 | 20.57 | 21.05 | − 8 | 11 |
| 6.vi | 50 | 21 | 21.27 | 21.12 | 15 | 19 |
| 17.vi | 1 | nr | nr | 21.21 | na | 18 |

22.v. and 29.v.1994, Table 4) are recorded as being evenings that were dark early because of heavy cloud.

## Other observations

### Behaviour

In 1990 the bats appeared to be unfamiliar with the location of the roost sites. They returned in noticeably separate groups. All the bats were flying competently, and although a number of bats circled after leaving the roost, such behaviour was prolonged in some individuals.

Some behaviour that had been observed in other years was particularly pronounced in 1992. For example, when only three bats were in the roost at No. 3, two often emerged, but returned to circle the roost until the third joined them. Bats in pairs were particularly noticeable at No. 5. One bat would emerge and circle until another bat came out and they flew off together. This occurred many times before the young were born.

### Disturbances

No attempt was made to quieten conversation or restrict movement when the bats were flying. Young children often play fairly noisily in front of the houses, but the bats did not seem to alter their direction in order to avoid them. On two occasions children exclaimed in startled surprise as a bat just missing them made them jump. The close is near to a busy main road, so the bats must be used to traffic. If bats were flying up to the roost entrance and a car turned suddenly into the close the bats immediately flew round farther away from the house. They would wait until the lights had gone before approaching the roost again.

## Discussion

### Numbers of bats

Various factors could account for the rise in the numbers of bats using the roosts. Some bats must be exhibiting philopatry and returning to the roost year after year. These bats could either be mothers who have used the roosts before or youngsters born in them. Recruitment in the roost could also be high, perhaps through information transfer and following from foraging or hibernation sites. Finally, new bats may have discovered the colony without previous knowledge of it.

### Duration of occupancy

The duration of occupancy has fallen since the peak in 1988. The correlation with increasing numbers of bats using the roosts would suggest that they become overcrowded. With so many bats using such a small space it is probable that the temperature becomes too great and this causes the colony to move after one or two hot summer days.

### Young bats

Constant movement of bats between roosts makes them very difficult to count and may have masked the birth and flight of the young in some years. In 1992 the young were quite a bit smaller than the adults and some of them were very small. It is possible that the young had been adversely affected by the drop in temperature, perhaps due to a corresponding drop in food availability.

### Temperature

The main effect of temperature seems to be its influence on the date the bats move on (see duration of occupancy, above).

### Emergence duration

The bats that remained in the roost may have been youngsters or nursing mothers (Corbet and Harris 1991). Useful comparisons can be drawn between the mean emergence durations of 19–30 minutes and the times of an hour or more when the young are beginning to fly. Emergence duration did not seem to be affected by factors such as temperature or delay after sunset.

### Intervals between sunset and emergence

Intervals between sunset and emergence of the first bats seen were fairly short and in the lower limits suggested by other studies (Church 1957, Swift 1980). The pre-sunset emergence times recorded on evenings also noted for their heavy cloud cover would suggest that the bats were using light intensity to cue emergence. However, other studies have found that this is not always the case (Erkert 1982), and bats appear to utilize an internal clock, the regulation of which is little understood.

### Behaviour

In 1990 the bats gave the impression that the place was strange to them and they did not know which way to fly. Perhaps this group of bats contained a larger than usual ratio of new recruits or immature individuals and this resulted in the odd behaviour being more noticeable.

Much interest has surrounded the theory that bats transfer information about roosts and foraging sites (Wilkinson 1995). The bats seen circling while apparently waiting for another bat could not have been simply mothers coaxing out juveniles since the behaviour was noted frequently before the appearance of the young. This observation therefore supports the hypothesis that bats follow one or accompany another from roost to foraging site.

## Summary

The use of four houses in the London Borough of Sutton by pipistrelle bats as a maternity roost has been monitored for ten years by the residents, making this the longest-recorded roost in Greater London (Stebbings, pers. comm.) Bat numbers have increased over the years with a peak of 75 recorded in 1992. The duration of the bats' stay varies, from 37 days in 1993 to 65 days in 1988. This may be due to overcrowding, but is also related to temperature. The bats vacate the roost when the weather becomes warm, but it is not known where they move to. Behaviour indicating information transfer between bats has been noted on several occasions. Young are easy to differentiate from the adults due

to their smaller size and more-hesitant flight patterns. Emergence durations are greater when the young are beginning to fly. The close is fairly busy with people and traffic, but this does not seem to disturb the bats.

## Acknowledgements

I am extremely grateful to the householders for counting the bats year after year and producing such a detailed, useful record. I hope that they will continue to count bats for many years to come. Thanks also to Clive Herbert for providing me with the data, and Paul Racey and Tony Hutson for their comments on earlier drafts of this paper.

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# A trapping survey of small mammals in Richmond Park, Surrey, and some implications for future conservation management

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## Abstract

Richmond Park (955 hectares) is a Royal Park of considerable ecological and amenity value in the south-west London area. Despite its importance for wildlife, little is known about the status of small mammals in the Park and there have been no systematic studies. During two weekends in autumn 1994 a live-trapping study was conducted covering seven locations representing three main habitat types, mixed deciduous woodland, acid tussock grassland and improved grassland. The aim was to provide up-to-date species records and relative abundance estimates (catch per unit effort) for comparisons between species and habitats and for comparison with published data from other study sites. Five species of small mammal were caught: wood mouse *Apodemus sylvaticus*, bank vole *Clethrionomys glareolus*, field vole *Microtus agrestis*, common shrew *Sorex araneus* and pygmy shrew *Sorex minutus*. All had been previously recorded for the Park. The relative abundance data obtained indicated that although the woodland sites supported small mammal populations (especially wood mice) comparable to those reported in the literature, the grassland habitats supported generally low small mammal populations; common shrews and field voles were particularly scarce. Various possible explanations are discussed, but it is clear that more systematic and longer-term studies are needed to obtain more-detailed ecological information about small mammals in the Park.

## Introduction

Richmond Park is an area of 955 hectares (2,358 acres) set in the conurbation of south-west London. It unites several adjacent areas, Sudbrook Park Golf Course and the commons of Petersham, Palewell, Ham and East Sheen, to form a total area of 1,060 hectares (Archer and Curson 1993). The Park has been maintained as a deer park since its establishment as a Royal Park in 1637, but its management and land-use have changed greatly over the years. Richmond Park includes the largest area of acidic grasslands in Greater London, about 218 hectares of woodland (including 70 hectares of fenced plantations) and almost 16 hectares of ponds and lakes. The most recent habitat survey was by the LUC (1984) and the Park remains much as it was then. It supports a wide range of wildlife of which the insects have been particularly studied (e.g. Barnard et al. 1986). However, little is known about the terrestrial small mammals (mice, voles and shrews) in the Park. Previous records have depended heavily on studies of prey remains in pellets from tawny owls *Strix aluco*, barn owls *Tyto alba* and little owls *Athene noctua*, e.g., Forsyth (1967) and Beven (1982). These studies have recorded field voles *Microtus agrestis*, bank voles *Clethrionomys glareolus*, common shrews *Sorex araneus*, pygmy shrews *Sorex minutus*, wood mice *Apodemus sylvaticus* and house mice *Mus domesticus*. Pellets are a useful source of small mammal records, but are a poor basis for estimates of relative abundance because of the biases resulting from predator preference and species differences in the prey vulnerability. Nevertheless, the presence of these species has been confirmed by a number of published observations, e.g., Collenette (1937), Fitter (1949), Teagle (1963), Beames (1968), who included some Longworth trapping records, Beames (1969), Simms (1974) and Cotton (1980). Additionally, water voles *Arvicola terrestris* were reported in 1902 (Collenette 1937), but Fitter (1949) noted that none had been found around Beverley Brook since the banks were concreted in 1930–7. Records of water shrews *Neomys fodiens* in 1909 are cited by Collenette (1937), a possible occurrence was reported by Fitter (1949), but the most recent was for 1966 (Beames 1968). Common rats *Rattus norvegicus* have also been recorded (Collenette 1937, Fitter 1949).

Despite these records there is a continuing problem of under recording in the London area, as previously noted by Towns (1972), and there has been no comprehensive survey of the Park's small mammal population and no published population density estimates. The aims of the present study were: (i) to determine which species of small mammal are now present by systematically surveying a range of representative habitat types, (ii) to provide rough relative abundance estimates (on a catch per unit effort basis) for each species and habitat type, (iii) to compare these abundance estimates with published data from other sites. Such data are needed to further understanding of the ecology of small mammals in the Park and for the evaluation of future environmental or species management projects.

## Methods

The study was carried out in autumn 1994 (23 September to 2 October), a time when rodent populations generally peak (Alibhai and Gipps 1985, Flowerdew 1985, Gurnell 1985). Longworth traps were used according to the guidelines in Gurnell and Flowerdew (1990) and were baited with mixed grain, blowfly pupae (for shrews), and dry hay bedding was provided.

Trap-lines were used so that a survey of the species present in as wide a range of habitats as possible could be conducted within the limited resources and time available. There were two weekend trapping sessions (23 to 25 September and 30 September to 2 October) each lasting 42 hours over the three days in which traps were set from 19.00 on Friday to 13.00 on Sunday and checked five times; twice at 09.00 and 13.00 and once at 21.00.

Seven sites were selected which could be grouped roughly into three main habitat types. Grid references are given to the nearest 10 metres:

1. **Mixed deciduous woodland:** Sites: B (Bog Dump Plantation, grid reference TQ 1930 7440), C (The Teck Plantation, TQ 1996 7447), and G (Sidmouth Wood, TQ 1910 7340)
2. **Acid tussock grassland:** Sites: A (The Conduit Stream area, TQ 1907 7420), and E (The Pond Slade area, TQ 1940 7220)
3. **Improved grasslands:** Sites: D (The Flying Field, TQ 2043 7370), and F (The Adam's Pond area, TQ 2075 7440).

Trapping effort was equal (180 trap-nights) in each of the three habitat categories, an overall total of 540 trap-nights, i.e., the number of traps used multiplied by the number of nights for which the traps were set. Detailed habitat descriptions for each of these sites were reported in Reeve and Jones

(1996). Three traps were set at each trapping station with stations arranged more or less linearly at either 5 m or 10 m intervals, but in practice this was varied when stations were found to be unsuitable for trap placement, e.g., the line crossed a path. All traps were set on the ground, usually adjacent to logs, at the base of trees, by anthills or grass tussocks or under the cover of bushes and other vegetation. None was set in above-ground vegetation. Traps had to be well hidden from public view which placed some limitations on trap positioning, but volunteers guarded vulnerable trap-lines during certain periods. Each trap bore an explanatory label to deter theft or disturbance, however on three occasions traps were disturbed (apparently turned over by deer or dogs) during the diurnal trapping period.

Captured animals were identified and sexed, age (adult/juvenile) and breeding status were estimated, then each was weighed using a spring balance, and fur-clipped prior to release so that recaptured animals could be identified.

The nomenclature follows Corbet and Harris (1991).

## Results

The total catches of all small mammals, expressed in trap-night index (TNI) units of catch per 100 trap-nights, are displayed in Table 1, showing both the total catch (i.e., including recaptures) and the number of individuals caught.

Fifty-seven captures were recorded during 540 trap-nights with an overall TNI of 10.56. The five species that were captured were all previously recorded in the Park. The wood mouse was the most abundant species, accounting for 56.1 per cent of the total captures. The other species were trapped in the following percentages: bank vole 19.3 per cent, field vole 14.0 per cent, common shrew 8.8 per cent and pygmy shrew 1.8 per cent. The overall mortality of small mammals within the traps was 3.5 per cent, (a wood mouse and a common shrew).

For each of the three main habitat types the total number of captures and number of individuals of each species, with their respective TNI values, are shown in Table 2.

The mixed deciduous woodland had the largest TNI at 18.33, mainly as a result of the number of captures of wood mice; a TNI of 15.56 for this species alone. Other species recorded were bank voles and common shrews.

The acid tussock grassland had a TNI of only 10.00, but was the most species-rich habitat with all five small mammal species present. The wood mice recorded for this habitat were confined to an area of bracken at the southern end of Site A. The most commonly caught species in this habitat were bank voles and field voles, both with a total catch TNI of 2.78. This was the only site where a pygmy shrew was caught.

The improved grassland was the poorest both in terms of the numbers of species present and the lowest TNI at 3.33. Bank voles and field voles were the

TABLE 1. The numbers of individuals, total catch (includes recaptures) and TNI* for species (Sites A–G) in Richmond Park.

| **Species** | **Trap-nights** | **No. of individuals** | **Total catch** | **TNI (individuals)** | **TNI (total catch)** |
|---|---|---|---|---|---|
| *A. sylvaticus* | 540 | 28 | 32 | 5.19 | 5.93 |
| *C. glareolus* | 540 | 8 | 11 | 1.48 | 2.04 |
| *M. agrestis* | 540 | 7 | 8 | 1.30 | 1.48 |
| *S. araneus* | 540 | 5 | 5 | 0.93 | 0.93 |
| *S. minutus* | 540 | 1 | 1 | 0.19 | 0.19 |
| All species | 540 | 49 | 57 | 9.07 | 10.56 |

*TNI (Trap-Night Index) = number per 100 trap-nights.

TABLE 2. The numbers of individuals, total catch (includes recaptures) and TNI* for species in each of 3 habitat categories (7 sites) in Richmond Park.

| **Habitat** | **Species** | **Trap-nights** | **No. of individuals** | **Total catch** | **TNI (individuals)** | **TNI (total catch)** |
|---|---|---|---|---|---|---|
| Mixed deciduous woodland (Sites B, C & G) | *A. sylvaticus* | 180 | 25 | 28 | 13.89 | 15.56 |
| | *C. glareolus* | 180 | 3 | 3 | 1.67 | 1.67 |
| | *M. agrestis* | 180 | 0 | 0 | 0 | 0 |
| | *S. araneus* | 180 | 2 | 2 | 1.11 | 1.11 |
| | *S. minutus* | 180 | 0 | 0 | 0 | 0 |
| | All species | 180 | 30 | 33 | 16.67 | 18.33 |
| Tussock acid grassland (Sites A & E) | *A. sylvaticus* | 180 | 3 | 4 | 1.67 | 2.22 |
| | *C. glareolus* | 180 | 3 | 5 | 1.67 | 2.78 |
| | *M. agrestis* | 180 | 4 | 5 | 2.22 | 2.78 |
| | *S. araneus* | 180 | 3 | 3 | 1.67 | 1.67 |
| | *S. minutus* | 180 | 1 | 1 | 0.56 | 0.56 |
| | All species | 180 | 14 | 18 | 7.78 | 10.00 |
| Improved grassland (Sites D & F) | *A. sylvaticus* | 180 | 0 | 0 | 0 | 0 |
| | *C. glareolus* | 180 | 2 | 3 | 1.11 | 1.67 |
| | *M. agrestis* | 180 | 3 | 3 | 1.67 | 1.67 |
| | *S. araneus* | 180 | 0 | 0 | 0 | 0 |
| | *S. minutus* | 180 | 0 | 0 | 0 | 0 |
| | All species | 180 | 5 | 6 | 2.78 | 3.33 |

*TNI (Trap-Night Index) = number per 100 trap-nights only species present and, with a TNI of 1.67 for both, were apparently less abundant than in the acid tussock grassland.

The bank vole, found in all three habitats, was the most widely distributed species. The pygmy shrew was the only species confined to just one of the study sites (Site A).

## Discussion

In the present study, the aim was to survey a previously unexamined site within the practical constraints of time and human resources. Hence, the relative abundance of species was expressed in units of TNI, as used by a number of previous studies (e.g., Yalden and Shore 1991, Singleton 1989, Delany and Farook 1989, Gurnell et al. 1992) although its reliability is questionable (Tanaka 1960).

### 1. Habitat differences

There were clear differences in the species composition and catch-rates in the different habitat categories:

**(i) Deciduous woodland** (Sites B, C and G)

The TNI value of 18.33 for the deciduous woodland sites suggests that small mammal abundance is roughly comparable with similar sites in other studies, e.g., Yalden and Shore (1991) reported a TNI of 18.0 for this habitat and, as in the present study, found the wood mouse to be the most abundant species. Wood mice are a characteristic rodent of deciduous woodlands (Flowerdew 1985), although the species also occurs where there is less ground cover (Montgomery and Bell 1981, Gurnell and Langbein 1983) and in a wide variety of other environments of varying productivity, including hedgerows, coniferous woodland, heather moorland, grassland and agricultural land (Gorman and Zubaid 1993). However, there was a low TNI of bank voles, somewhat surprising since these are habitat generalists, found in a variety of woodland habitats, but with a preference for ground cover (Gurnell 1985). Two common shrews, also habitat generalists with a preference for low ground cover, were caught (TNI of 1.11). The absence of field voles in these sites was expected, as these typically specialize in open or scrubby grassland (Gurnell 1985).

**(ii) Grassland habitats** (Sites A, D, E, F)

Judging from the TNI data, the overall abundance of small mammal species in Richmond Park grassland habitats is much lower than reported by other similar studies. Rogers and Gorman (1995) reported a TNI of 86.63 and 32.1 for a range of small mammals trapped on two sites of set-aside pasture grassland. Fa et al. (1990) also reported an overall TNI of a small mammal population in a Mexican grassland of 34.48 (corresponding to a density of 56.43 $ha^{-1}$). This is compared with TNI values of only 10.00 (acid tussock grassland) and 3.33 (improved grassland) in Richmond Park. Although one should be wary of direct comparisons between these studies, a very rough estimation might be 5–16 $ha^{-1}$ on the Richmond grassland sites, a very low abundance. An examination of data for individual species in grassland areas follows:

**a.** Wood mice

For wood mice on grassland set-aside sites, Rogers and Gorman (1995) reported TNI values of 17.6 and 64.6 which corresponded to densities of 0–11 $ha^{-1}$ and 0–33 $ha^{-1}$ respectively. For the Richmond Park grassland habitats in this study the TNI figures were strikingly low, 2.22 (acid tussock grassland) and 0 (improved grassland).

**b.** Bank voles

TNI figures suggest a very low abundance of bank voles in Richmond Park grassland habitats. Rogers and Gorman (1995) reported TNI values of 0 and 10.7 (corresponding to a density of 0–13.28 voles per hectare), whereas this study found a TNI of 2.78 (acid tussock grassland) and 1.67 (improved grassland).

**c.** Field voles

Southern (1973) reported a TNI of 54.87 for field voles in an ungrazed grass field. Rogers and Gorman (1995) reported TNI for field voles of 7.4 and 10.9 (corresponding to densities of 0–7.9 $ha^{-1}$ and 0–18.11 $ha^{-1}$ respectively) in set-aside grassland pasture sites. Redpath et al. (1995) reported an estimated TNI of 79 in grassland, corresponding to a very high density of 123.43 $ha^{-1}$. However, the latter study used snap-trapping which typically yields higher vole catch rates than live trapping. All these figures are much higher than found in the present study for Richmond Park grassland habitats (TNI values of 2.78 and 1.67 for acid tussock and improved grassland respectively).

**d.** Shrews

Shrews were at a very low abundance in the habitats studied with the highest catches of both common and pygmy shrew in the acid tussock grassland (TNI values of 1.67 and 0.56 respectively). This would seem to indicate densities much lower than found by Yalden (1974) in rough grassland. Although the numbers were small, they agreed with findings that common shrews are most abundant in thick grass and hedgerows and that pygmy shrews tend to be less abundant than common shrews (Trump 1989).

Overall, although the woodland (fenced plantation) sites seemed to support fairly typical population levels of small mammals, and five species of small mammal were recorded in the Park, the TNI values from the grassland sites suggested unusually small populations in comparison to those reported by other studies. Most unexpected was the apparent dearth of field voles in the open grassland, typically a stronghold habitat (Gurnell 1985). The low TNI values may either reflect a genuinely low population or be a product of methodological shortcomings (see below). Nevertheless, despite the likelihood of an underestimate, the present study does seem to indicate a genuinely low population for this species. A prior Longworth trapping study (in 1966, reported by Beames 1968) found field voles to be abundant in Richmond Park, although insufficient detail was reported to calculate a TNI value.

## 2. Methodological issues

In any trapping-based population survey many factors may bias the results obtained. Certain species are inherently less trappable than others and would have been under represented in the present study. For example, pygmy shrews weigh so little that they may not activate the trap treadle mechanism and are thus likely to be much less efficiently sampled by Longworth traps than are the heavier common shrews (Gurnell and Flowerdew 1990, Trump 1989). Also some species, such as field voles, seem less prone to entering live traps than others. Redpath et al. (1995) noted that live trapping proved to be the least satisfactory trapping method for estimating the abundance of field voles with low numbers caught even when subsequent snap trapping showed them to be abundant. However, in the present study snap trapping would have been unacceptable.

In the present study, the concentration of work into two short trapping periods may have allowed insufficient time for resident animals to discover and enter the traps. A grid of traps, more suitable for longer-term population studies using capture–mark–recapture methods and a protocol suitable for analysis techniques such as Jolly's stochastic method (Begon 1979), could have yielded more reliable population estimates as well as range size data for marked individuals. However, the use of trap lines was largely determined by the aim of the study to survey as many of the Park's habitats as possible within the constraints of time and resources. Furthermore, the heavy use of the Park by the public, and hence the likely disturbance or removal of traps (and markers), constrained the choice of sites and ruled out prebaiting as a strategy.

The spacing and distribution of traps can greatly affect trapping performance. Trap spacings of 10 m or 15 m have become standard in small mammal research (studies cited by Tew et al. 1994), but smaller spacing may be better in denser habitats and for some species. For example, Gurnell and Gipps (1989) concluded that trap spacing greater than 10 m may miss female bank voles and result in low capture success. Also, there is some evidence that smaller trap spacing may increase the rate at which the population is sampled (Tew et al. 1994) — although this was based on a comparison of two widely-spaced grids (24 m and 48 m) trapping highly mobile wood mice in arable farmland. The present study aimed to catch the broadest possible range of species, both sedentary and mobile, with a high efficiency of trapping effort, hence the decision in favour of close spacing of traps. Nevertheless, the 5–10 m trap spacings used in the present study were probably rather too small for efficient sampling of wood mice (very mobile) in open grassland. On arable land, wood mice may have home ranges of up to 8 ha (Tew 1989 as cited in Tew et al. 1994) and are five times more wide ranging and sparsely distributed than their woodland counterparts (Wolton 1985, Tew 1989 as cited in Tew et al. 1994).

A further complication in a survey of this type is the effect of habitat structure on the trappability of some species. Gurnell and Langbein (1983) reported that in woodland mice were most frequently captured in traps alongside logs or at the base of trees and almost all bank voles caught were in traps placed under bushes. This relates to these animals using such objects as cover and pathways to move about their living space. Hence in the present study traps were generally placed adjacent to fallen logs, at the base of trees and so on. In woodland, Tattersall and Whitbread (1994) found that 20 per cent of wood mouse and 14 per cent of bank vole captures were arboreal (in the shrub and canopy layers), suggesting that in any population study just focusing on ground-based traps (as in the present study) a considerable percentage of the population may be missed.

These are some of the principal limitations on the conclusions that may be drawn from the present study and there is a clear need for further, longer-term work to provide better quantification of population densities for small mammals in the Park.

### 3. Management and conservation issues

The results of the present study suggest that the densities of these small mammals may be very low for the types of grassland present in the majority of Richmond Park. Although it is clear that the methodological constraints of the study will have ensured an underestimate of the abundance of certain species, the apparently low numbers of small mammals in the grasslands is of some concern. Some possible explanations for these findings are reviewed below:

**a.** Poor grassland productivity and grazing competition

One restraining factor on population size may be the low productivity of the acid grasslands dominating the Park, and the possible additional effects of the grazing competition provided by the very large (but unquantified) populations of rabbits *Oryctolagus cuniculus* as well as approximately 700 red and fallow deer *Cervus elaphus* and *Dama dama*. Such poor productivity and competition could directly affect vole populations (herbivorous) but would only have indirect effects on shrews (insectivorous). Where grass is kept short by heavy grazing by deer and rabbits (and by cutting), as in certain areas of improved grassland, there would be insufficient cover for small mammals. In the present study, improved grassland had the lowest TNI values of all.

**b.** Predation pressure

There is little reliable information on the abundance of predatory species in Richmond Park. Avian predators present include kestrels, little owls and tawny owls. These could exert considerable predation pressure on mammal populations, for example tawny owls may take 20–30 per cent of the standing crop of bank voles (Alibhai and Gipps 1991). There are also numerous ground predators, including weasels *Mustela nivalis*, foxes *Vulpes vulpes* and badgers *Meles meles*, although there are no published population estimates for any species. The predation pressure that may be represented by domestic cats *Felis catus* from surrounding residential areas is a possible but unknown factor. Weasels have access to the entire population of mice and voles regardless of weather, moonlight or vegetation cover and predate them in their nests (unlike owls), as well as readily taking adult field voles, bank voles and wood mice when they are active (King 1985). Foxes are abundant in the Park and must be important predators of the small mammals. Although not a principal prey item for badgers, it is clear that small mammals can be an important source of food. Most preferred are field voles, taken in preference to bank voles even when the latter are abundant, but a wide variety of mammalian prey of various sizes may be taken up to and including rabbits and hedgehogs *Erinaceus europaeus* (Neal 1977, Neal and Cheeseman 1991).

**c.** Human disturbance

The trampling and disturbance of large numbers of visitors to the Park, especially when combined with unrestrained dogs, could also be a factor contributing to depressed populations of some mammals. LUC (1990) estimated the number of visitors and dogs on four census days. The numbers ranged from 1,065 dogs and 5,379 people on the January census day, to 1,671 dogs and 12,293 people on the October census day. Between 16 per cent (Sundays and bank holidays) and 30 per cent (weekdays) of visitors bring dogs with them and only a minority (12–16 per cent) of dogs are restrained (LUC 1990). The effects and levels of disturbance by people and their dogs remains unquantified and should be the subject of further study.

Although these factors may contribute to plausible explanations of the low abundance of small mammals found in the present study, and it may be important to consider such factors in any management strategy, it is equally important to remember the methodological limitations of the study discussed earlier. Furthermore, small mammal populations are well known to fluctuate greatly from year to year (e.g., Alibhai and Gipps 1991) and one should be wary of conclusions based on only a single season of study. A series of further trapping studies is therefore recommended to obtain more detailed information about small mammal populations. Such studies should employ more systematic and longer-term live-trapping protocols and be replicated over two or more years. They should also include a more systematic inclusion of arboreal trap locations within the woodland habitats. Additionally, although two of the trapping lines ran parallel to, and within a few metres of, watercourses (Sites A and B), it is likely that the sampling was biased against water shrews. Also, Longworth traps are too small for adult water voles, and these will therefore have been largely excluded from the study. Both water voles and water shrews are London Red Data Book animals and future studies should aim clearly to establish their true status in Richmond Park. The aim of these further trapping studies would be to assist in the development of ecological management plans for Park habitats which seek to combine the aims of maximizing biological diversity, of ensuring the sustainability of biological communities, and of the conservation of plant and animal species within and around Richmond Park.

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# A check-list of the mammals of the London Area, 1900–1994

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## Abstract

This paper covers the period from 1900 to 1994 inclusive and updates the only existing check-list to the mammals of the London Area, which was published in 1949. The revised check-list comprises 56 species, of which 11 represent species new to the Society's recording area, while only three have not been confirmed in the period since 1949. The year of the most recent record is given for all species.

## Introduction

The first check-list to the mammals of the London Area was written over forty years ago (Fitter 1949). Since that time, much new survey work has been undertaken and a range of papers has been published in *The London Naturalist* about mammals within the Society's recording area.

Annual summary reports have been published by previous recorders for many of the years up to 1979, although the locations given often only refer to general areas and not to identifiable sites. In some cases this prevents targeted resurveying to confirm the continued presence of a species.

In addition to the various annual mammal reports, a number of papers documenting individual species have been published in the years up to 1987. These papers have covered grey squirrel *Sciurus carolinensis* (Beven 1957), harvest mouse *Micromys minutus* (Teagle 1964), hedgehog *Erinaceus europaeus* (Morris 1966), weasel *Mustela nivalis*, stoat *Mustela erminea*, common shrew *Sorex araneus*, roe deer *Capreolus capreolus*, water shrew *Neomys fodiens* and mole *Talpa europaeus* (Burton 1966), fox *Vulpes vulpes* (Teagle 1967), badger *Meles meles* (Teagle 1969) and bats Chiroptera (Mickleburgh 1987).

The policy of the Ornithological Section of the Society to publish details whenever a new species is added to the London Area list has never been adopted before the appointment of the present recorder (Herbert 1995). The publication of a new species for London is important in order to promote the study of any colonization (e.g. fat dormouse *Glis glis*), or to highlight the need to monitor the success of introductions (e.g. otter *Lutra lutra*). It is intended that any future additions to the new check-list will be published, although it may be necessary to withhold site information for sensitive and vulnerable species or where private land is involved.

## The new check-list, 1900–1994

As no past records were provided to the author upon appointment as LNHS recorder, this updated check-list is based on his personal database, together with records held by other organizations in the adjoining counties and information from papers published since 1949.

In the original 1949 check-list, a description of the status and distribution of each species was given. This has not been possible for the current check-list and the provision of a revised check-list was considered an overriding priority which should not be delayed in order to incorporate additional information.

The latest check-list retains non-native species which are included on the British list and have had feral colonies in the past in Britain, for example, musk rat *Ondatra zibethicus* and coypu *Myocastor coypus*. These are included in the totals given below. Species which are not on the British list (Corbet and Harris 1991) and have occurred in the London Area solely as introductions or releases and for which there is no evidence of an established British feral population, for example banana mouse *Nyctomys sumichastri*, have been deleted. The totals below have been adjusted accordingly.

The 1899 record of a fin whale *Balaeonoptera physalus* has been retained in the current check-list in square brackets in order to maintain uniformity with the 1949 list. It has not, however, been included in the totals below.

A total of 45 species was listed in the original check-list for the period 1900–1949. I have been able to locate records for all these species since 1949 except three: musk rat, which is now extinct in Britain, narwhal *Monodon monoceros*, and common dolphin *Delphinus delphis*.

The revised check-list for the period 1900–1994 includes a total of 56 species. The eleven new species are Brandt's bat *Myotis brandtii*, parti-coloured bat *Vespertilio murinus*, northern bat *Eptesicus nilssonii*, Leisler's bat *Nyctalus leisleri*, Nathusius's pipistrelle *Pipistrellus nathusii*, fat dormouse, minke whale *Balaenoptera acutorostrata*, mink *Mustela vison*, grey seal *Halichoerus grypus*, sika deer *Cervus nippon* and muntjac *Muntiacus reevesi*.

The year of the most recent record for each species is given. This excludes the release of red squirrels *Sciurus vulgaris* during the 1980s into Regent's Park and records of park deer. A total of 35 species was recorded wild or feral in the London Area in the final year covered by this check-list. The nomenclature used in the systematic list below follows Corbet and Harris (1991).

## Order Insectivora

### FAMILY ERINACEIDAE

| | |
|---|---|
| **Hedgehog** *Erinaceus europaeus* | Latest record: 1994 |

### FAMILY TALPIDAE

| | |
|---|---|
| **Mole** *Talpa europaea* | Latest record: 1994 |

### FAMILY SORICIDAE

| | |
|---|---|
| **Common shrew** *Sorex araneus* | Latest record: 1994 |
| **Pygmy shrew** *Sorex minutus* | Latest record: 1994 |
| **Water shrew** *Neomys fodiens* | Latest record: 1994 |

## Order Chiroptera

### FAMILY RHINOLOPHIDAE

| | |
|---|---|
| **Greater horseshoe bat** *Rhinolophus ferrumequinum* | Latest record: 1953 |
| **Lesser horseshoe bat** *Rhinolophus hipposideros* | Latest record: 1953 |

### FAMILY VESPERTILIONIDAE

| | |
|---|---|
| **Whiskered bat** *Myotis mystacinus* | Latest record: 1994 |
| **Brandt's bat** *Myotis brandtii* | Latest record: 1984 |
| **Natterer's bat** *Myotis nattereri* | Latest record: 1994 |
| **Daubenton's bat** *Myotis daubentonii* | Latest record: 1994 |
| **Parti-coloured bat** *Vespertilio murinus* | Latest record: 1994 |
| **Serotine** *Eptesicus serotinus* | Latest record: 1994 |
| **Northern bat** *Eptesicus nilssonii* | Latest record: 1987 |
| **Noctule** *Nyctalus noctula* | Latest record: 1994 |
| **Leisler's bat** *Nyctalus leisleri* | Latest record: 1994 |
| **Pipistrelle** *Pipistrellus pipistrellus* | Latest record: 1994 |
| **Nathusius's pipistrelle** *Pipistrellus nathusii* | Latest record: 1989 |
| **Barbastelle** *Barbastella barbastellus* | Latest record: 1968 |
| **Brown long-eared bat** *Plecotus auritus* | Latest record: 1994 |

## Order Lagomorpha

### FAMILY LEPORIDAE

| | |
|---|---|
| **Rabbit** *Oryctolagus cuniculus* | Latest record: 1994 |
| **Brown hare** *Lepus europaeus* | Latest record: 1994 |

## Order Rodentia

### FAMILY SCIURIDAE

| | |
|---|---|
| **Red squirrel** *Sciurus vulgaris* | Latest record: 1954 |
| **Grey squirrel** *Sciurus carolinensis* | Latest record: 1994 |

### FAMILY MURIDAE

| | |
|---|---|
| **Bank vole** *Clethrionomys glareolus* | Latest record: 1994 |
| **Field vole** *Microtus agrestis* | Latest record: 1994 |
| **Water vole** *Arvicola terrestris* | Latest record: 1994 |
| **Musk rat** *Ondatra zibethicus* | Latest record: 1934 |
| **Wood mouse** *Apodemus sylvaticus* | Latest record: 1994 |
| **Yellow-necked mouse** *Apodemus flavicollis* | Latest record: 1993 |
| **Harvest mouse** *Micromys minutus* | Latest record: 1994 |
| **House mouse** *Mus domesticus* | Latest record: 1994 |
| **Common rat** *Rattus norvegicus* | Latest record: 1994 |
| **Ship rat** *Rattus rattus* | Latest record: 1989 |

### FAMILY GLIRIDAE

| | |
|---|---|
| **Common dormouse** *Muscardinus avellanarius* | Latest record: 1994 |
| **Fat dormouse** *Glis glis* | Latest record: 1994 |

### FAMILY CAPROMYIDAE

| | |
|---|---|
| **Coypu** *Myocastor coypus* | Latest record: 1961 |

## Order Cetacea

### FAMILY BALAENOPTERIDAE

| | |
|---|---|
| [**Fin whale** *Balaenoptera physalus* | Latest record: 1899] |
| **Minke whale** *Balaenoptera acutorostrata* | Latest record: 1961 |

### FAMILY MONODONTIDAE

| | |
|---|---|
| **Narwhal** *Monodon monoceros* | Latest record: 1949 |

### FAMILY PHOCOENIDAE

| | |
|---|---|
| **Porpoise** *Phccoena phocoena* | Latest record: 1979 |

### FAMILY DELPHINIDAE

| | |
|---|---|
| **Common dolphin** *Delphinus delphis* | Latest record: 1947 |
| **Bottle-nosed dolphin** *Tursiops truncatus* | Latest record: 1960 |

## Order Carnivora

### FAMILY CANIDAE

| | |
|---|---|
| **Fox** *Vulpes vulpes* | Latest record: 1994 |

### FAMILY MUSTELIDAE

| | |
|---|---|
| **Stoat** *Mustela erminea* | Latest record: 1994 |
| **Weasel** *Mustela nivalis* | Latest record: 1994 |
| **Polecat/ferret** *Mustela putorius/M. furo* | Latest record: 1994 |
| **Mink** *Mustela vison* | Latest record: 1993 |
| **Badger** *Meles meles* | Latest record: 1994 |
| **Otter** *Lutra lutra* | Latest record: 1994 |

## Order Pinnipedia

### FAMILY PHOCIDAE

| | |
|---|---|
| **Common seal** *Phoca vitulina* | Latest record: 1994 |
| **Grey seal** *Halichoerus grypus* | Latest record: 1964 |

## Order Artiodactyla

### FAMILY CERVIDAE

| | |
|---|---|
| **Red deer** *Cervus elaphus* | Latest record: 1979 |
| **Sika deer** *Cervus nippon* | Undated (post 1949) |
| **Fallow deer** *Dama dama* | Latest record: 1987 |
| **Roe deer** *Capreolus capreolus* | Latest record: 1994 |
| **Muntjac** *Muntiacus reevesi* | Latest record: 1994 |

## Acknowledgements

The author is grateful to the many individuals who have submitted records since his appointment as the Society's mammal recorder. Particular thanks are also due to the surrounding county recorders for their kind assistance in exchanging information and records: John Dobson (Essex), Alison Tutt (Surrey) and Jenny Jones and Michael Clark (Hertfordshire).

Finally, Dr Pat Morris, chairman of The Mammal Society, read and commented on the draft manuscript for this updated check-list.

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# Particoloured bat *Vespertilio murinus* near Ilford: new to the London Area

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## Abstract

This paper documents the occurrence in autumn 1994 of a particoloured bat near Ilford in the London Borough of Barking & Dagenham. It represents the first record of the species in the London Area.

## Introduction

The particoloured bat is distributed from Afghanistan across to central Europe and southern Scandinavia. Elsewhere in north-western Europe, including Britain, it occurs only as a rare vagrant (Stebbings 1988). It is considered to be strongly migratory, especially in the eastern part of its range, with recorded movements of up to 850 kilometres (Strelkov 1969).

There are five documented records, excluding specimens from offshore oil rigs, of the particoloured bat in Britain this century. Three individuals have been found on the Shetland Islands (March 1927, November 1981 and November 1984). The remaining two records are from Cambridge (November 1985) and Brighton (March 1986), confirming the spring and autumn pattern of occurrences (Corbet and Harris 1991).

## Identification

The particoloured bat is a medium-sized species with a forearm length of 40–49 mm, a head and body length between 55–64 mm and a wingspan of 260–330 mm (Corbet and Harris 1991). Its appearance is distinctly grizzled or frosted due to the light grey or cream tips to the otherwise dark brown dorsal fur. The ears are squarish, with a short and rounded tragus, the wings narrow and the tail membrane has a long calcar and post-calcarial lobe. No other bat resident in Europe possesses two pairs of mammary glands.

These characteristics make the particoloured bat easily recognizable and there should be little chance of either overlooking or misidentifying this species. Unlike Nathusius's pipistrelle *Pipistrellus nathusii* (Herbert 1995), the paucity of particoloured bat records is likely to represent a more accurate picture of its status as an extremely rare vagrant to Britain.

## The first London Area record

The first record for the London Area was made on 22 October 1994 when a grounded bat was discovered by a householder on the fourth floor of a block of flats near Ilford (TQ485892) in the London Borough of Barking & Dagenham. The bat was collected later that day by John Cox and subsequently identified as an adult female particoloured bat by John Dobson, the Essex county mammal recorder and coordinator of the Essex Bat Group (Dobson 1994).

The individual appeared to be in good condition. It weighed 19 g, with a forearm length of 45.6 mm, and was successfully released on 24 October 1994. The occurrence of this individual was not associated with an influx of Nathusius's pipistrelles to Britain (Hutson 1995), a species which is a rare migrant and winter visitor to Britain (Speakman et al. 1991).

## Acknowledgements

The author is grateful to John Dobson for providing supplementary data concerning this record and for general advice about the species, without which, this short note could not have been written.

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# The butterflies of Epping Forest

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## Summary

The butterfly fauna of Epping Forest is reviewed from published nineteenth and twentieth century sources and from recent unpublished data. A total of 44–46 species is believed to have bred in the Forest at some time during the last two centuries. Butterfly species declined from a peak of 38–41 species in 1800 to 19 ubiquitous species in 1950, one of which was a new colonizer. Since then five species have recolonized naturally, of which four are honeydew feeders. The possibility that these natural recolonizations may, in part, be due to lowered particulate air pollution is discussed. An experimental re-establishment of *Thecla betulae* is recommended.

## Introduction

Emmet (1979) reviewed the history of Lepidoptera in the Epping Forest region and reached the following conclusions (amongst others):

**a.** Epping Forest had never been a very good habitat for Lepidoptera.
**b.** The decline in the diversity of species over the years was more apparent than real: a result of comparing the present with the consolidated records of the past.
**c.** Such declines as had occurred were not a consequence of poor forestry management.
**d.** The true history of Lepidoptera in the Forest was obscured by under recording, especially in recent times.
**e.** Pollution has had little direct influence on insects other than those that feed on lichen.

These conclusions were reached by a review of the full range of Lepidoptera, including the little-studied Microlepidoptera. Here I wish to re-examine these conclusions, but with reference only to the butterflies: a group that has been studied in much more detail than other lepidopteran taxa.

I also attempt to provide up-to-date information on the status of all Epping Forest's species of butterfly and to highlight those areas of high priority for further research and conservation action.

## Methods

The historical survey part of this work has relied primarily on the succession of publications summarizing the status of butterflies in Essex, the London area, or specifically Epping Forest, that have appeared during the last two centuries: Doubleday (1836), English (1887), Fitch (1891), Meldola (1891), Harwood (1903), Mera (1929), Pinniger (1945), de Worms (1949, 1958), Anon. [Corke] (1961), Corke (1968), Firmin and Pyman (1975), Emmet, Pyman and Corke (1985), Emmet (1978), Hanson (1983, 1992), and Plant (1987): an average of one major source every ten years since the 1830s. All the species reported in these compilations have been included in Table 1, except in those few cases

TABLE 1. A check-list of butterfly species believed to have bred within the current bounds of Epping Forest (as residents or regular migrants) since 1800. The sources for this tabulation are given in the text.

| **English name** | **Scientific name** | **Key** | **1800–1849** | **1850–1899** | **1900–1949** | **1950–1969** | **1970–1990** | **1991–1995** |
|---|---|---|---|---|---|---|---|---|
| Small skipper | *Thymelicus sylvestris* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Essex skipper | *Thymelicus lineola* | | | | | ???1950s★★★ | ★★★★★★★★ | ★★★★ |
| Large skipper | *Ochlodes venata* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Dingy skipper | *Erynnis tages* | K | ★★★★★★★★ | ★★★★★★★★ | ★★1944 | (?1956) | | |
| Grizzled skipper | *Pyrgus malvae* | K | ★★★★★★★★ | ★★★★★★★★ | ★★1944 | (?1960) | | |
| Swallowtail | *Papilio machaon* | K | ★★★1820s | | | | | |
| Wood white | *Leptidea sinapis* | K | ★★★★★1840s | | | | | |
| Black-veined white | *Aporia crataegi* | X | ★★★★★★★★ | ★1840s?1870s | | | | |
| Brimstone | *Gonepteryx rhamni* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Large white | *Pieris brassicae* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Small white | *Pieris rapae* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Green-veined white | *Pieris napi* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Orange-tip | *Anthocharis cardamines* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Green hairstreak | *Callophrys rubi* | K | ?????????????????????see text | | | | | |
| Brown hairstreak | *Thecla betulae* | K | ★★★★★★★★ | ★★★★★★★★ | ★1900s | | (?1980s) | |
| Purple hairstreak | *Quercusia quercus* | K | ★★★★★★★★ | ★★★★★★★★ | ★1900 | 1960s★★ | ★★★★★★★★ | ★★★★ |
| W-letter hairstreak | *Satyrium w-album* | K | ★★★★★★★★ | ★★ | | | 1976★★★★★★ | ★★★★ |
| Small copper | *Lycaena phlaeas* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Silver-studded blue | *Plebejus argus* | K | ★★★★★★★★ | ★★★★★★★★ | 1900s | | | |
| Brown argus | *Aricia agestis* | K | ★★★★★★★★ | ★★★★★★★★ | 1900s | | | ★★★★ |
| Common blue | *Polyommatus icarus* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Chalk hill blue | *Lysandra coridon* | K | | 1859★★★★★1892 | | | | |
| Holly blue | *Celastrina argiolus* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Duke of Burgundy | *Hamearis lucina* | K | ??????see text | | | | | |
| White admiral | *Ladoga camilla* | K | ?★?1830s | | ★1940s | ?1960 | ?1986 | |
| Purple emperor | *Apatura iris* | K | ★★★★★★★★ | ★★★★★★★1890s | | | | |
| Red admiral | *Vanessa atalanta* | M | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Painted lady | *Cynthia cardui* | M | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Small tortoiseshell | *Aglais urticae* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Large tortoiseshell | *Nymphalis polychloros* | X | ??????????★★★ | ★★★★★★★★ | ★★★★★★1940s | | | |
| Peacock | *Inachis io* | | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Comma | *Polygonia c-album* | | ★★1820s | | 1930s★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★ |
| Sm. pearl-bdrd frit. | *Bolaria selene* | K | ★★★★★★★★ | ★★★★★★★1900s | | | | |
| Pearl-bordered frit. | *Bolaria euphrosyne* | K | ★★★★★★★★ | ★★★★★★★1900s | ★1940s | | | |

TABLE 1. — *continued.*

| **English name** | **Scientific name** | **Key** | **1800–1849** | **1850–1899** | **1900–1949** | **1950–1969** | **1970–1990** | **1991–1995** |
|---|---|---|---|---|---|---|---|---|
| H. brown fritillary | *Argynnis adippe* | K | ★★★★★★★ | ★★★★★★★★ | 1920s | | | |
| Silver-washed frit. | *Argynnis paphia* | K | ★★★★★★★ | ★★★★1870s | | | | |
| Marsh fritillary | *Eurodryas aurinia* | K | ★★★★★★★ | ★★★★1872 | | | | |
| Heath fritillary | *Mellicta athalia* | K | ★1839 | | | | | |
| Speckled wood | *Pararge aegeria* | | ★★★★★★★ | ★★★★1890s | | ?1960s★★ | ★★★★★★★★★ | ★★★★ |
| Wall | *Lasiommata megera* | | ★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★★ | ★★★★ |
| Marbled white | *Melanargia galathea* | K | ★★★1830s | | | | | |
| Grayling | *Hipparchia semele* | K | | ?1869 | | | | |
| Gatekeeper | *Pyronia tithonus* | | ★★★★★★★ | ★★★★★★★★ | 1900 | 1960s★★ | ★★★★★★★★★ | ★★★★ |
| Meadow brown | *Maniola jurtina* | | ★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★★ | ★★★★ |
| Ringlet | *Aphantopus hyperantus* | | ★★★★★★★ | ★★★1890s | | | | |
| Small heath | *Coenonympha pamphilus* | | ★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★ | ★★★★★★★★★ | ★★★★ |
| Totals<br>44 + ?2 | all species | | 38 + ?3 | 32 + ?3 | 28 + ?1 | 19 | 22 | 24 |
| Totals<br>20 + ?2 | key species | | 17 + ?1 | 11 + ?2 | 9 + ?1 | 0 | 1 | 3 |
| Years for total | | | 1800 | 1878 | 1900 | 1950 | 1970 | 1991/5 |

Key:
K = key species — forming compact, habitat-dependent colonies.
X = nationally extinct species.
M = regular migrant, not resident in Britain.
? = doubtful record or record from just outside Forest boundary.
For details see text.

The gap before the 1991–1995 figures is to emphasize the 'current' status. The totals are for fairly obvious dates, except 1878 which was chosen as the year that Epping Forest came into the care of the Corporation of the City of London.

where there is serious doubt as to the authenticity or exact locality of the record: in each case these doubts are referred to in the text on the species concerned.

## Results

Forty-six species have been listed in Table 1: for these there is reasonably convincing evidence that they have bred at some time since 1800 within the present boundaries of Epping Forest. For all the more interesting and unusual records, the original sources, referred to in the above compilations, have been checked by me and are summarized in the species accounts below. The nomenclature for all butterfly species is that given in Emmet and Heath (1989) and for plants that in Jermyn (1974).

During 1991 a research assistant (Stephen Davis), aided by volunteer observers, made timed butterfly counts in nine localities within the Forest (Table 2) as part of the wider Essex Butterfly Habitat Survey. The survey technique is described in full in Davis and Corke (1992).

TABLE 2. Summary of butterfly species recorded at nine sites within the Epping Forest area during the 1991 flight season. The figures are the numbers of sightings per hour on the day of peak abundance, rounded to the nearest whole number. *indicates that a species was observed at the site, but not during a timed count.

| | | | | | Site* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Small skipper | 19 | | 18 | 17 | 1 | | 150 | 35 | 3 |
| Essex skipper | 2 | | 2 | 3 | 1 | | 24 | 2 | 1 |
| Large skipper | | 7 | | | 11 | 6 | | * | 6 |
| Brimstone | | | | | | | 2 | 1 | 1 |
| Large white | 2 | 4 | <1 | 1 | 4 | 3 | 12 | | 6 |
| Small white | 2 | | 3 | 1 | 1 | | 46 | | 5 |
| Green-veined white | | | 4 | | 1 | 1 | 4 | <1 | 6 |
| Orange-tip | | | | | 6 | | | | 12 |
| Purple hairstreak | 2 | | 7 | 1 | <1 | 2 | | | 5 |
| White-letter hairstreak | | | | | 2 | 24 | | | 4 |
| Small copper | 3 | 2 | 8 | | | | 2 | <1 | |
| Holly blue | <1 | | 1 | 2 | 2 | <1 | 3 | <1 | 3 |
| Brown argus | | | <1 | | | | | | |
| Common blue | 16 | 15 | 6 | | | | 4 | * | |
| Red admiral | <1 | | | | 1 | | <1 | | 2 |
| Painted lady | | | | | | | | | 3 |
| Small tortoiseshell | 2 | | 4 | 3 | <1 | | 3 | 5 | <1 |
| Peacock | 5 | | <1 | 2 | 1 | | 4 | 10 | 17 |
| Comma | <1 | | 1 | | 2 | 2 | 1 | 3 | 1 |
| Speckled wood | 8 | | 4 | 1 | 4 | 24 | 2 | 2 | 10 |
| Wall | 1 | | 2 | | 1 | | 3 | <1 | 2 |
| Gatekeeper | 60 | | 40 | 120 | 24 | 4 | 60 | 46 | 46 |
| Meadow brown | 9 | 60 | 75 | 3 | 50 | 60 | 16 | 40 | 54 |
| Small heath | 11 | 60 | 3 | | 2 | 3 | | * | |
| Date first survey | 04 | 05 | 07 | 08 | 05 | 05 | 08 | 08 | 04 |
| Date last survey | 08 | 07 | 08 | 08 | 08 | 08 | 08 | 08 | 08 |
| Number of surveys | 5 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 8 |

*Site names:

1. Yardley/Pole Hill (Figure 1)
2. Yate's Meadow (Figure 2)
3. Fairmead (Figure 3)
4. Sheppards Meadow (Figure 4)
5. Clapgate Lane
6. Puck Lane
7. Epping Long Green East
8. Epping Long Green West
9. Galleyhill

### Species excluded from the Epping Forest list

These species, reported from the Forest at various times, fall into two clear groups:

**a.** Species which migrate irregularly to Britain (or are vagrants within Britain) and have occasionally been seen in the Forest:

Clouded yellow *Colias croceus.* An irregular migrant which has been reported in some numbers from the Forest in those years when it was found abundantly in southern England: 1877, 1892, 1928, 1943 and 1983, with a scattering of single specimens in some other years.

Pale/Berger's clouded yellow *Colias hyale/australis.* Several sightings in 1842–4 and 1868 (Fitch 1891). This was before the distinction between the two species was known.

Bath white *Pontia daplidice.* A single sighting 1866 (Fitch 1891).

Dark green fritillary *Argynnis aglaja.* A vagrant seen in a garden at Loughton in 1943 (Simes 1946) and another (probable) in 1974 (Firmin and Pyman 1975).

Camberwell beauty *Nymphalis antiopa.* There are several scattered sightings quoted in Fitch (1891). Also two recent records from near the Forest in 1976 (Emmet 1979) and 1983 (Plant 1987). There was at least one further sighting in 1995: a year when there were many sightings of this species on the eastern side of Britain.

**b.** Species reported once only from the Forest and where the accuracy of the report is in serious doubt.

Apollo *Parnassius apollo.* An alpine species that could only reach southern England as a result of release of captive specimens. Reported in the 1840s: see Emmet, Pyman and Corke (1985).

Mazarine blue *Celastrina semiargus.* A report of one in 1860 (Fitch 1891) at a time the species was already extinct in eastern England.

Large blue *Maculinea arion.* 'Rarely seen here' (Mitchell 1991) in an article notable for a number of errors and misunderstandings. The species has never existed in Essex.

Small blue *Cupido minimus.* An undated record 'from the Epping District' (Harwood 1903) is attributed to Messrs J. A. Clarke and W. Machin. The fact that the foodplant, kidney vetch *Anthyllis vulneraria*, was not found in the Forest and that the lepidopterists working in the Epping district at the time did not locate this species, must cast doubt on this record. The record in Morris (1865) of this species from 'Amesbury' has sometimes been taken as an Epping Forest record, but from the context it is obvious that Amesbury in Wiltshire is intended. The foodplant has recently been located on Bell Common in artificially seeded ground (Hanson, pers. comm.).

Purple-edged copper *Lycaena hippothoe.* Reported pre 1815: a species not now thought ever to have existed in Britain (Emmet and Heath, 1989).

Weaver's fritillary *Clossiana dia.* Dubious record in 1883 refuted recently (Emmet, Pyman and Corke 1985).

## Species accounts

SMALL SKIPPER *Thymelicus sylvestris*

Always known as a common species of open grassy areas. A preference for wetter grasslands was noted in Fitch (1891).

These photographs illustrate parts of the Forest where timed count studies of butterflies were made (see Table 2). All were taken by Dr Jeremy Dagley.

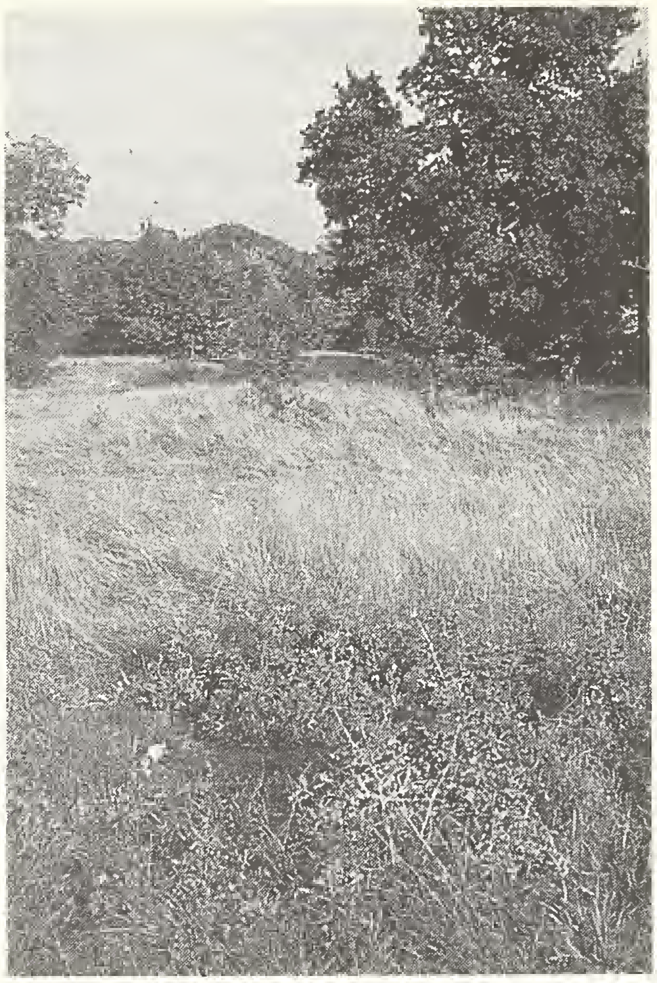

FIGURE 1. Pole Hill, October 1991.

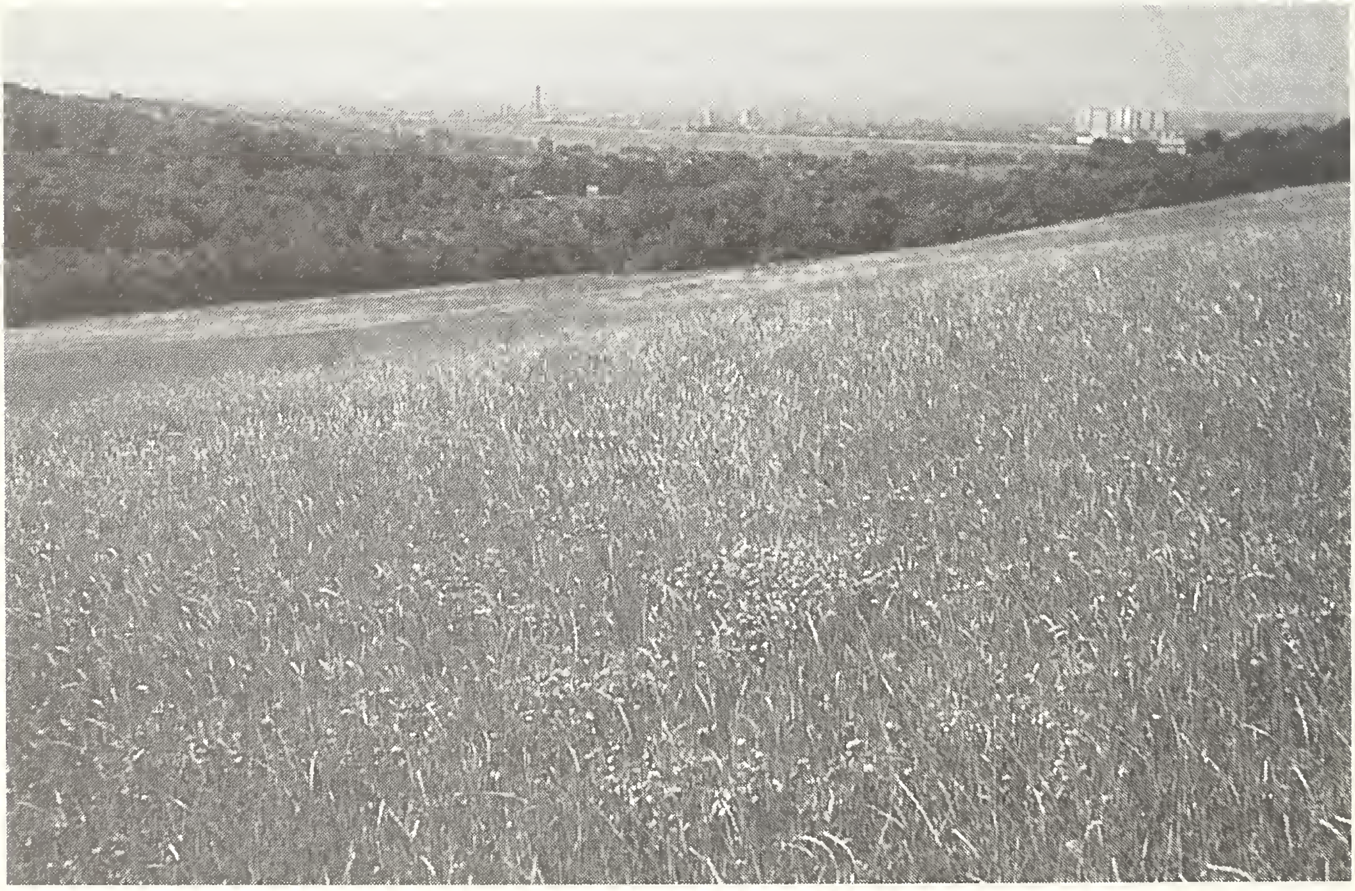

FIGURE 2. Yate's Meadow, June 1995.

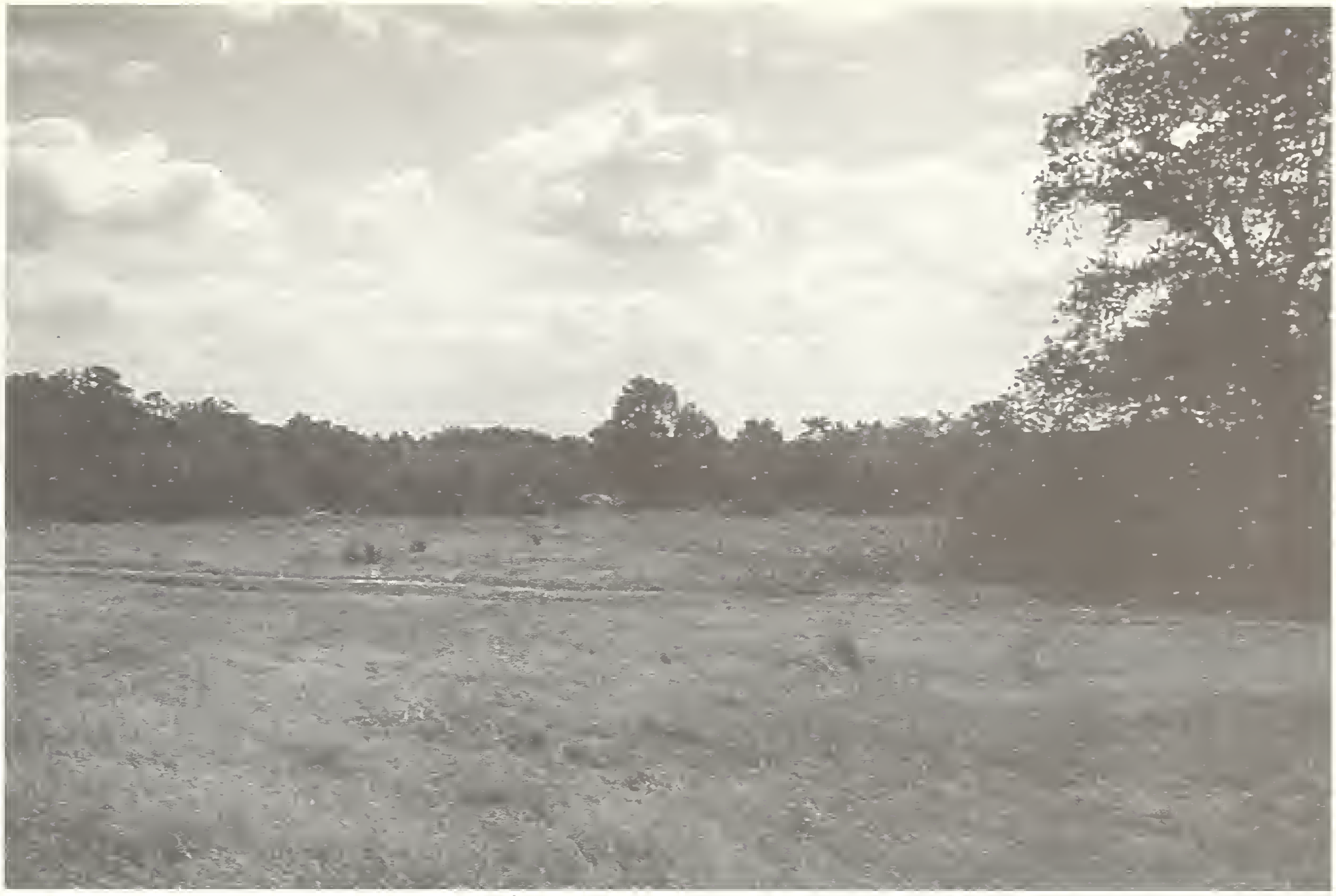

FIGURE 3. Fairmead, August 1990.

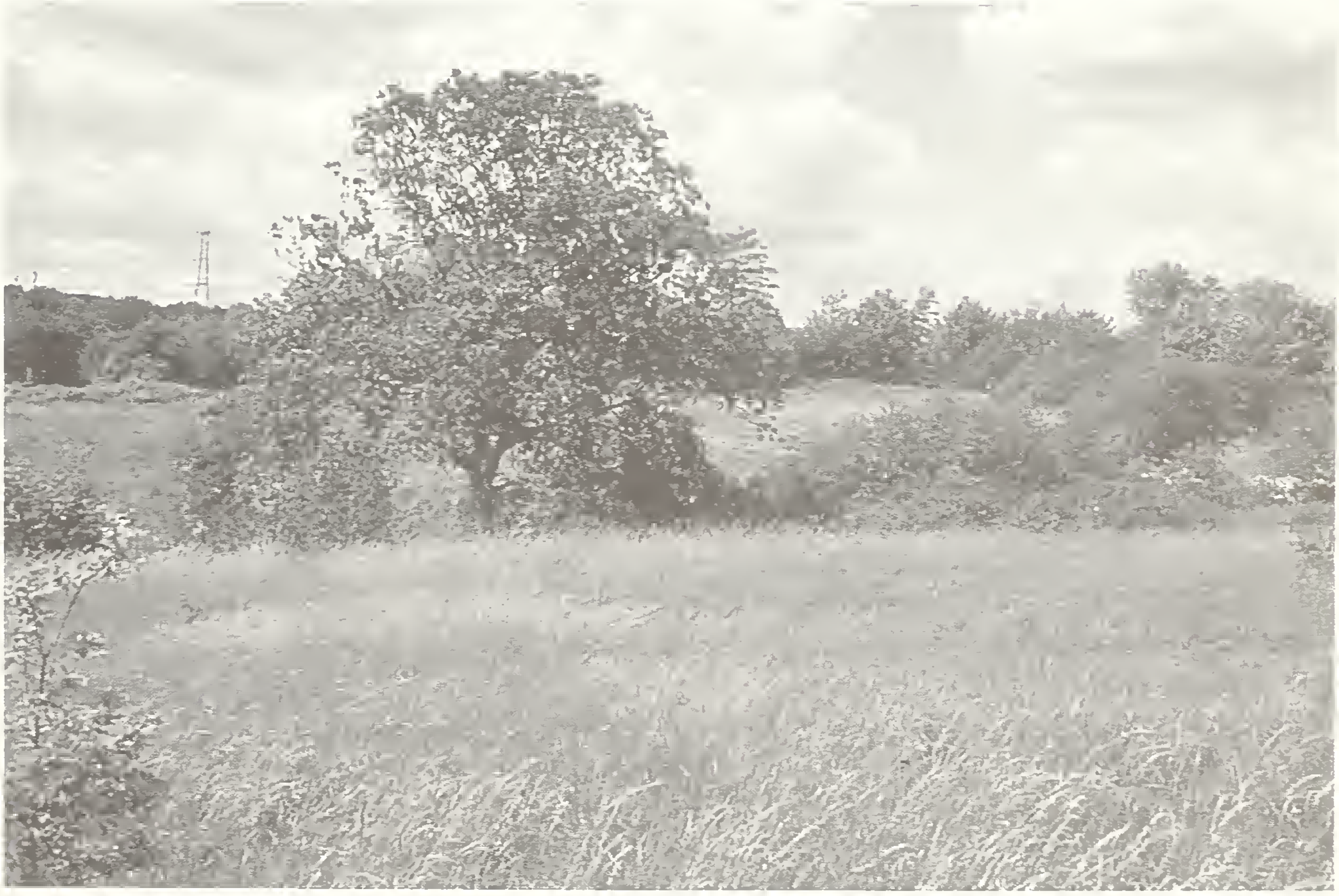

FIGURE 4. Sheppards Meadow, June 1990.

ESSEX SKIPPER *Thymelicus lineola*

First distinguished from *Thymelicus sylvestris* in Britain in 1890 on the Essex coast and then believed to be a coastal species. The early records from the Forest Gate area (Plant 1987, quoting Buckell and Prout 1899) appear to have been misinterpreted: Buckell and Prout clearly refer to *O. venata* (but by its old name *Erynnis sylvanus*), which Plant apparently equated with *T. lineola.* The evidence points to the Forest not being colonized until the mid twentieth century: the first published record being from the 1950s (Anon. 1961). It is unlikely to have been overlooked before this date since Mera (1929) and Pinniger (1945) listed 'skipper' sightings for the Forest which did not include the Essex skipper. It is now common and as widespread as the small skipper. The species is spreading in England (Thomas and Lewington 1991) and it seems probable that it has genuinely colonized the Forest and become common since the 1940s.

LARGE SKIPPER *Ochlodes venata*

Recorded in the Forest by all main surveys. A widespread and common species, more tolerant of partially shaded conditions than the two previous species.

DINGY SKIPPER *Erynnis tages*

The last records from the Forest were in 1942–4 in the Cuckoo Pits area (Pinniger 1945). Before then it was frequently reported. A single specimen was recorded in the grounds of Hawkswood House, 100 metres from the Forest boundary, in 1956 (Corke 1968).

GRIZZLED SKIPPER *Pyrgus malvae*

As with the dingy skipper, this species was reported frequently pre World War II and was last seen in the Cuckoo Pits area in 1942–4 (Pinniger 1945). In the Hawkswood House grounds (in an area now, but not then, part of Epping Forest) it survived as a breeding species until 1960 (Corke 1968).

SWALLOWTAIL *Papilio machaon*

The several reports from Epping Forest and the Lea Valley dating from the first twenty or thirty years of the nineteenth century give a clear indication that this was then a resident breeding species. Since the foodplant of the British subspecies *P.machaon britannicus* is milk parsley *Peucedanum palustre* and this was known from Epping Forest from John Ray's time (mid 1600s) until the mid 1800s (Gibson 1862), there is every reason to believe that Epping Forest then supported a colony of the British swallowtail. Doubleday attempted to re-establish the species in the Forest between 1848 and 1850, without success (Fitch 1891).

WOOD WHITE *Leptidea sinapis*

Recorded as 'plentiful in the woodland glades' in 1839 (English 1887), but the locality seems to have been the Gaynes Park area just outside the Forest boundary. Doubleday (1836) reported a single specimen from Epping in 1835. There seems to be no published basis for the assertion by de Worms (1949) that the wood white was 'common in Doubleday's time in Epping Forest and even lurked in that vicinity till the 1880s'.

BLACK-VEINED WHITE *Aporia crataegi*

Reported from 'Epping' in 1884 (Raynor 1912) and at Wanstead shortly before 1879 (Carrington 1879) although Fitch (1891) thought this record 'very doubtful'.

BRIMSTONE *Gonepteryx rhamni*

Has always been known from the Forest and is still found, usually at low density, in most areas. The larval foodplants *Rhamnus catharticus* and *Frangula alnus* were both known from the Forest at low density when the *Flora of Essex* was written (Jermyn 1974), but the latter species may now be extinct and the former is rare (Hanson, pers. comm.). Brimstones fly over wide areas in search of mates and foodplants and can thus be seen in habitats well away from the breeding areas.

LARGE WHITE *Pieris brassicae*
SMALL WHITE *Pieris rapae*
GREEN-VEINED WHITE *Pieris napi*
ORANGE-TIP *Anthocharis cardamines*

The same comments apply to all four surviving species of 'whites': they have always been known from the Forest, are widespread at medium density and are more common near the Forest edges than in the central wooded areas. Their main breeding grounds are likely to be surrounding gardens (small and large whites) and roadside verges (green-veined white and orange-tip).

GREEN HAIRSTREAK *Callophrys rubi*

Doubleday (1836) recorded a single specimen from the Epping area. There is no other published report of this species occurring in Epping Forest except a hearsay report in Anon. (1961) which should be disregarded (see under brown hairstreak, below). Fitch (1891) reported that the species (in Essex as a whole) was 'not common, but generally distributed'. From its known preference for heathy areas and open, sunny woodland, both of which habitats were in greater abundance in Epping Forest at the turn of the century than they are today, Fitch's statement might imply its presence in Epping Forest, since its absence would have been surprising and would have called for comment. The 10 km squares in which the Forest occurs (TQ48, TL40) both had pre-1940 records in the Heath, Pollard and Thomas (1984) edition of the BRC maps. The nature and origin of these records is unknown. The post-1970 records for these squares in Emmet and Heath (1989) are for Hainault Forest and Harlow respectively.

BROWN HAIRSTREAK *Thecla betulae*

If this species survives in the Forest, as has been suggested, then it is undoubtedly the most important butterfly species in the Forest. It is a rapidly declining species and is extinct everywhere else in East Anglia and from much of eastern England. The brown hairstreak's status in Epping Forest is a mystery which demands a rather lengthy discussion. The facts are these: Epping Forest was a renowned collecting ground for the larvae of this species (obtained by beating *Prunus spinosa*) in the second half of the nineteenth century (Fitch 1891, Mera 1929). Entomologists who knew how and where to find the larvae ceased to be able to do so during the 1880/90s. Exactly when the last larvae were found is in doubt: Mera (1929) says 'It is as far back as 1881 since I last took the larvae from Epping Forest, although I have been given to understand that it was taken as late as 1895'. Gilles (1932) reporting on the Mera collection of Lepidoptera, then recently acquired by the Essex Field Club, said 'Included among the brown hairstreaks are nine specimens bred from Epping Forest in 1894'. Smith (1892) found a larva in the High Beach area in 1891. No larvae have been found since the turn of the century and the species was assumed to be extinct, perhaps driven to extinction by overcollecting of the larvae.

In 1961 (Anon.) a report on Epping Forest butterflies appeared which included a second-hand report of a sighting of brown hairstreaks at Loughton.

The unintentionally anonymous author of that paper was then a sixteen-year-old schoolboy and is now the author of this paper! The report was based on a sighting by another schoolboy who now (1995) has no recollection of the event. This report should be discounted. The first-hand reports of other species contained in the Anon. (1961) paper are genuine; only the final paragraph should be disregarded.

In 1983 and 1984 reports of the rediscovery of the brown hairstreak in Epping Forest started circulating on the entomological grapevine. These crystallized into two published reports: A record from M. Catt of four adults in 1983 and a single ovum in 1984 reported in Emmet et al. (1985), and the distribution map in Plant (1987) showing records from two Forest tetrads and a statement that the colony was in a precarious state following removal of eggs by collectors.

Following these reports, four major pieces of negative information have accrued:

**a.** A group of British Butterfly Conservation Society members, led by Martin Catt, failed to find the species in the area of the original reports shortly after the reported rediscovery.
**b.** Groups of BBCS members have searched apparently suitable *Prunus* shrubs for eggs during the winter of 1990/1 without success. The overwintering eggs are said to be the easiest stage to find (Thomas and Lewington 1991). More recent searches have also been unsuccessful.
**c.** Enquiries have been made of Colin Plant at the Passmore Edwards Biological Records Centre for further details of the records on which his publication was based. It appears that the details have been mislaid although the Epping Forest Conservation Centre has a detailed report from M. Catt and C. Dell of two sightings of singletons in August 1983, one of which was captured for positive identification.
**d.** Following the granting of a licence by the Epping Forest Conservators, Stephen Davis made systematic searches for larvae in 1992 using a beating tray. None was found.

In the light of the above, there are three plausible hypotheses to explain the situation:

**a.** Brown hairstreaks became extinct in Epping Forest at the turn of the century and were re-established by unreported release (or natural recolonization) during the 1980s. They were rediscovered at an early stage in the recolonization process, which either failed due to natural causes or exterminated or made very rare by collecting.
**b.** The reports of the 1980s rediscovery are in error: the brown hairstreak has been extinct in the Forest since the turn of the century.
**c.** The brown hairstreak has continued to live in (the apparently suitable habitat in) Epping Forest throughout the last 100 years. The low density and retiring habits which are part of the normal ecology of the species (Thomas and Lewington 1991) have enabled it to survive almost undetected throughout the twentieth century and frustrated the recent systematic attempts to find it.

In my opinion **a** is the most plausible: the brown hairstreak no longer occurs in Epping Forest and has not been an established resident species there this century. This is surprising since, unlike other species which have been lost to the Forest due to loss of suitable habitat, the necessary habitat for brown hairstreaks seems to have been present throughout this century. Large areas of apparently suitable blackthorn are still present. Assuming there is no unknown habitat requirement that now makes the Forest unsuitable, the only plausible explanations for the species' loss are overcollection or air pollution. It is widely believed that overcollecting rarely exterminates a butterfly population (Warren 1992). Air pollution, although often played down as a cause of butterfly losses (e.g., Pollard and Eversham 1995), is a possible cause for this species since the adults fly late in the year and feed only on honeydew (Porter et al. 1992): they would thus be feeding from the surface of old leaves carrying a maximum load of airborne pollutants. Both these factors could have applied at the turn of the century and no longer apply. In this case a well-planned attempt to re-establish the species could be expected to work.

I strongly recommend that the relevant authorities grant permission for a suitable conservation body to carry out and monitor such a re-establishment attempt [at the time of writing English Nature and the Conservators of Epping Forest have granted conditional permission. It is hoped that the re-establishment will be made in 1997].

PURPLE HAIRSTREAK *Quercusia quercus*

Abundant in the nineteenth century but a total absence of records this century until the 1960s (Corke 1968).

WHITE-LETTER HAIRSTREAK *Satyrium w-album*

'Very rare, Epping' (Doubleday 1836) seems to be the only early report from the Forest area, even at times in the 1940s and 1950s when it was reported from many parts of Essex. The first recent report was in July 1976: a single adult feeding on a creeping thistle flower on Warren Hill and a further specimen feeding at bramble on the edge of Woodford Golf Course in June 1989 (Hanson 1992). The 1991 survey (Table 2) showed that this hairstreak is common in those small woods and lanes that are legally part of Epping Forest but physically separate from the main body of the Forest. This species was once feared to be in great danger because of the loss of mature, flowering elms to Dutch elm disease (Thomas 1991), but this does not seem to have happened. It may now breed more often on regenerating elm suckers which might make it easier to find, also it has been seen laying on planted elms of disease-resistant strain near Woodredon in one of the buffer zones that surround parts of the Forest proper (Burman, pers. comm.). Whether the new records indicate a recolonization of the Forest or the recent rediscovery of a species that never left the area, is unclear. It could well be the former if the species' diet of honeydew made it susceptible to airborne pollutants late in the last century and the first half of this one.

SMALL COPPER *Lycaena phlaeas*
COMMON BLUE *Polyommatus icarus*

These two species have always been known from the open grassy areas of the Forest. It is worth noting that the 1991 survey (Table 2) detected these two species together at all four sites where either occurred.

SILVER-STUDDED BLUE *Plebejus argus*

The famous colony on heathy ground in the High Beach area was known throughout the nineteenth century (Fitch 1891). It was not reported after Harwood (1903) and presumably became extinct early this century due to loss of suitable open heathland.

BROWN ARGUS *Aricia agestis*

Widespread in the nineteenth century and long known in the Forest. There were no reports this century until the sighting of a single specimen at Fairmead in August 1991 (Table 2). This has been followed by regular sightings on a ride in the Lower Forest in 1992–4 and a further specimen at Epping Long Green in 1994 (I. Newbery, pers. comm.). The species has been found to be much more widespread in Essex since 1991 than in previous years. This is believed to be associated with a switch in its main larval foodplant in Essex to the dove's-foot cranesbill *Geranium molle.* A genuine expansion and recolonization of the Forest may be under way. The current hay cutting and removal in Fairmead is likely to benefit this species.

CHALK HILL BLUE *Lysandra coridon*

A colony existed in clover fields at Epping (presumably not part of the Forest, but on agricultural land) and with many reports from the Loughton/Epping parts of the Forest in the period 1859–92 (Fitch 1891, Argent 1892). Clearly its normal habitat of chalk/limestone grassland with *Hippocrepis comosa* is most unlikely to have been present at that time in the Forest and the temporary colonies are assumed to have survived on secondary foodplants (Emmet and Heath 1989). '. . . in the year 1866, when beating for autumnal larvae in Epping Forest, I observed Corydon here and there in all the drives through the Forest: I caught some half-dozen, and only notice the circumstance on account of the absence of chalk' (Newman 1871). Such suitable conditions could have developed in the Forest following the disturbance due to the building of the Epping New Road which was completed in 1834, but this is pure speculation.

HOLLY BLUE *Celastrina argiolus*

A widespread species, very common in 1991/2 and now (1995) rarer again. This is a species with well-known and large-scale fluctuations in abundance throughout its range in Britain.

DUKE OF BURGUNDY *Hamearis lucina*

Only the report of English (1887) 'flew in the woods above mentioned [Gaynes Park area] as well as in the open forest lands: it held its own fairly well for three years [from 1839], and then suddenly vanished', indicates that this may once have been a Forest resident.

WHITE ADMIRAL *Ladoga camilla*

A single specimen near Park Hall, Epping (Doubleday 1836) indicates an early presence in the Forest area. White admirals clearly colonized and became established during the 1930s and 1940s judging from the regular sightings at that time (Burkill in 1930 at Buckhurst Hill and Epping Forest, Pinniger in 1944 in Cuckoo Pits area, Dent in 1944 in Epping Forest, and Pratt in 1945 in Epping Forest and Wintry Wood). Later records are few: Page (1961) reported five from 'a short gravel lane near Epping' in 1960: this was actually just outside the Forest on Coopersale Common/Gernon Bushes (Page 1961). Plant (1987) reported eight in Galleyhill Woods in 1986: these may have been vagrants as the area was visited frequently during 1991 and none was seen nor were any suitable foodplants located.

PURPLE EMPEROR *Apatura iris*

The few Forest records in the nineteenth century are summarized by Fitch (1891) the most recent being 'of late years' at the time he was writing. The sighting in 1983 (Emmet et al. 1985) was most probably the result of an error of identification or a released captive insect. There is no evidence of the species having bred in the Forest this century.

RED ADMIRAL *Vanessa atalanta*
PAINTED LADY *Cynthia cardui*

The above two species are regular migrants to Britain, much more common in the Forest in some years than others, but reported regularly.

SMALL TORTOISESHELL *Aglais urticae*
PEACOCK *Inachis io*

The above two nettle-feeding, resident species have been known continuously in the Forest. They are normally common, but breed mainly at the Forest edge on nettle patches in full sun.

LARGE TORTOISESHELL *Nymphalis polychloros*

I have located no records for the first half of the nineteenth century, and Fitch (1891) does not give any Forest localities. The only nineteenth century record is Cole (1897) who listed it as a species which 'seems to be increasing'.

The only subsequent Epping Forest record which is likely to be a genuine wild insect is from 1948 at a time when large tortoiseshells were quite widespread in Essex (Firmin et al. 1975). A few more-recent reports or rumours are likely to be mistaken identifications or escaped captives.

COMMA *Polygonia c-album*

Emmet (1979) summarizes the situation well: 'It occurred in profusion in Doubleday's boyhood but disappeared inexplicably in about 1820. It was more than a century before its return, now to be seen regularly.' It has continued to be seen regularly between 1979 and the present. Its disappearance from the 1820s to the 1930s was part of a national retraction in range, not peculiar to the Forest.

SMALL PEARL-BORDERED FRITILLARY *Boloria selene*
PEARL-BORDERED FRITILLARY *Boloria euphrosyne*

These two species form discrete colonies in woodland clearings and heathlands with a high abundance of violets. No such habitats exist in the Forest today. Both species were well known in the nineteenth century and said to be increasing (Cole 1897) at the turn of the century. Neither has a confirmed record in the Forest this century: but there is reasonable evidence that the pearl-bordered persisted, perhaps until the late 1940s. It was found in Gernon Bushes on 19 May 1948 (Pratt 1949) and Coopersale Common on 12 May 1949 (Pratt 1950). An undated report 'Common near Loughton Camp (Vallins)' in de Worms (1959) implies that this may be a post-1949 record since the 1959 publication was a supplement to his earlier paper.

SILVER-WASHED FRITILLARY *Argynnis paphia*
HIGH BROWN FRITILLARY *Argynnis adippe*

The above two larger fritillaries were implied to be present, but not common, throughout the nineteenth century in the reports cited by Fitch (1891) and Emmet (1979). Mera (1929) reported two sightings of the high brown fritillary, in 1917 and 1921.

MARSH FRITILLARY *Eurodryas aurinia*

Known from High Beach and Epping area in the first half of the nineteenth century (records summarized by Fitch 1891), and from Wanstead Flats based on a single report. The last record from the Forest was in 1874 (Harwood 1903).

HEATH FRITILLARY *Mellicta athalia*

The only report is from High Beach in 1839 (English 1887).

SPECKLED WOOD *Pararge aegeria*

This is now a common and widespread butterfly having become so since the 1960s with the main period of expansion in the 1970s and 1980s. It may be significant that the recolonization seems to have occurred from north to south, with the species being common at High Beach in the late 1970s some years before it became common as far south as Wanstead Park in the early 1980s (Epping Forest Conservation Centre information). The recolonization was natural and coincided with a period of expansion across Essex: the releases of a few individuals at Chingford in the 1950s (Corke 1968) are unlikely to have been important. The species was present through most of the nineteenth century and disappeared at a time of regional decline (Emmet 1975). This species is a honeydew feeder: see discussion below on the possible significance of air pollution.

WALL *Lasiommata megera*

Known continuously from the Forest, but with fluctuating abundance. Usually it is quite rare.

MARBLED WHITE *Melanargia galathea*

The several reports in Fitch (1891) show that this species was present and sometimes abundant in the Forest during the early nineteenth century. There have been none reported since 1835.

GRAYLING *Hipparchia semele*

A single record based on a specimen collected by Meldola in 1869 is listed by de Worms (1959). I am grateful to Dr G. C. McGavin of the Hope Entomological Collections for checking the specimen at my request. It has a data label 'Epping Forest Sept 8/69', plus an acquisitions label stating that it was from the Meldola collection. It is described as a rather washed-out looking male which appears to be rather smaller than the norm. The heathlands in the Forest, then suitable for *Plebejus argus*, are likely to have been adequate habitats for *H. semele.*

GATEKEEPER *Pyronia tithonius*

Now a very common species throughout the Forest as it was during the nineteenth century. It certainly was absent from the Pole Hill/Hawkswood areas in the 1950s and 1960s (Corke 1968) where it is now the commonest species (Table 2). Also absent in Lords Bushes in the 1970s and early 1980s (Hanson 1983), it is now abundant (Hanson 1992). The first records this century were from the Theydon Bois area in the late 1960s (Corke 1968). This southwards (citywards) extension of range coincides with a national extension northwards. The accepted explanation of its northwards extension is an improvement in the climate (Pollard and Eversham 1995), but its well-known absence from cities (Thomas and Lewington 1991) does suggest that other factors may also be involved of which the most probable is air pollution (see discussion below).

MEADOW BROWN *Maniola jurtina*

One of the commonest Forest butterflies in the open grassy areas. It has always been common.

RINGLET *Aphantopus hyperantus*

Reported as common in the Forest by Meldola (1891) and was known to Doubleday (1836), but there are no other records except a single vagrant in the 1970s (Emmet 1979) and an unconfirmed report from the Copthall Green area in the 1980s. This species is widespread in Essex and may be expanding its range. Its future recolonization of the Forest is a probability.

SMALL HEATH *Coenonympha pamphilus*

Continuously present in open, sunny habitats in the Forest.

## Discussion

As the second largest woodland SSSI in Britain and the longest established and largest area of protected land in Essex (greater in extent than all the other inland nature reserves put together) Epping Forest must clearly have been immune to many of the factors sometimes blamed for the decline of butterflies (habitat fragmentation, conversion to agriculture and urban land, use of pesticides, too-frequent hedge-trimming, introduction of pheasants). Nonetheless it has shown a loss of twenty species of butterfly between the time of peak diversity in 1800 and the low point in 1950. Sixteen of these are 'key' species with the tendency to form discrete colonies and dependent on very precise habitat requirements (the species listed as 'rare and localised' in Pollard and Eversham 1995). One species (the Essex skipper) colonized during this period.

The tendency for key species to disappear from nature reserves and other 'protected' habitats is very well known (Thomas 1984) and is due mainly or entirely to habitat changes consequent upon reduced or changed habitat management. The main difference between what happened in Epping Forest and the events at (for example) Monks Wood (Thomas 1984) is that the losses started much earlier in Epping Forest. Since Epping Forest was, to some extent, a nature reserve from 1878 (long before the term 'Nature Reserve' received its legal definition) there has been a long time for changes in management to have their effect. Cessation of pollarding tended to create more closed forest although some thinning occurred, some drainage reduced wet habitats associated with the creation of ponds, while social and economic changes reduced the numbers of grazing cattle (Rackham 1978, Ranson 1978).

It should be noted that two species of satyrine (gatekeeper, speckled wood) were lost from the Forest at the end of the last century and have now recolonized at a time of general expansion in Britain. Unlike most of the expansion, this has involved a southwards movement which may suggest a response to reduced air pollution since the 1950s. Significantly these are the only two species of satyrine that feed extensively on honeydew: an excellent source of airborne pollutants deposited on leaves. All the other honeydew feeders (purple hairstreak, white-letter hairstreak, brown hairstreak, white admiral, purple emperor) disappeared at the end of the last century. The first two have now recolonized. In most of the Forest the habitat is now unsuitable for white admirals. There is real doubt as to whether the purple emperor was ever established in the Forest as a breeding species. The apparent suitability of the Forest for the brown hairstreak is discussed above. Presumably its nearest colonies are too remote to permit natural recolonization.

The loss of the comma and the brown argus, both now recolonized and both subject to national declines and re-expansions, is most likely to be due to the two species switching foodplants following the decline of their earlier major foodplant.

The conclusions reached by Emmet (1979) (see Introduction) clearly do not apply to the Epping Forest butterfly fauna: it was once the best-known habitat in Essex and would then (1800) have rivalled most other good habitats in the Home Counties. It has not been under recorded and the existing records document the declines rather well. The decline has been all too real: to the point where only ubiquitous species survive plus three key species: two hairstreaks dependent on mature trees, rather than less-stable habitats, and the brown argus. All three have recolonized the Forest since 1960 judging from available records. The losses of some species may have been due to air pollution in former times (see above), but the losses of the other key species which feed at ground level (including all the fritillaries) is entirely due to changed forestry management.

The diversity of Forest butterflies reached a low point in the 1950s and 1960s. There are now marked improvements related to the introduction of more-informed Forest management practices and the reduction of air pollution around London. The brown argus has recolonized the Forest and this is possibly a result of the present grassland management practices. Further dramatic changes in management would be required before habitats suitable for any of the fritillaries could be restored.

Far from being under recorded, the detailed records of butterfly species, whose habitat requirements are now rather well understood, can add to the picture of the habitats present in the Forest in times past, based on botanical records made at the time.

The immediate priorities for futher research on Epping Forest butterflies are:

1. An experimental and closely monitored re-establishment of the brown hairstreak to discover whether Forest habitats are now as suitable for this rare species as they appear to be.
2. Survey of the density of grassland butterflies on Forest habitats under different management regimes to assess the effects of these new management practices.
3. Survey of the distribution of the two buckthorn bushes (brimstone foodplants) to avoid further loss of these local shrubs when scrub clearance is contemplated or when lack of clearance shades them out.
4. Monitoring the spread towards the Forest (if any) by the ringlet.

These are all urgent if the Forest is to continue to show the reversal of the tendency to lose its butterfly species.

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# Book reviews

***Alien plants of the British Isles.*** E. J. Clement and M. C. Foster. London: Botanical Society of the British Isles. 1994. xviii, 590 pp. £15. ISBN 0 901158 23 2.

***Alien grasses of the British Isles.*** T. B. Ryves, E. J. Clement and M. C. Foster. London: Botanical Society of the British Isles. 1996. xx, 181 pp. £10.50. ISBN 0 901158 27 5.

The three named authors, all members of the London Natural History Society, have done a great service to the botanical community at large with these two publications. They give references to records of non-native plants in Britain, to sources of botanical descriptions of them and more particularly to illustrations. The species are characterized as far as possible according to the mode of their introduction and the frequency of their occurrence. Families and genera are arranged systematically, so that alien plants can be fitted into place in the sequence of genera in D. H. Kent's *List of vascular plants of the British Isles* (BSBI 1992), but within each genus the arrangement of species is alphabetical. Taxonomic problems are mentioned where appropriate. The *grasses* volume, dealing with a much smaller number of species, has a number of features for which there was no space in the earlier volume: it includes species which occur in the British Isles both naturally and as exotics (but not *Brachypodium pinnatum*); it has a section of line drawings by G. M. S. Easy in which over a hundred species are illustrated; and there are keys to bamboos and to the species of some of the larger or more difficult genera.

*Alien plants of the British Isles* is subtitled *A provisional catalogue* . . . Mr Clement and Mrs Foster are clearly aware of the danger of their work rapidly becoming out of date, as new species are found. In my view these books will continue to be useful as they are, though my own copies are likely to become encrusted with annotations.

Rodney Burton

# Spider records for the London Area in 1995

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## Abstract

New spider records and other interesting finds for the counties of London and Middlesex during 1995 are noted, with some comments. The exceptionally high number of new records is contrasted with results from recent years.

## Introduction

Although there were no finds quite as unusual as the rediscovery of *Atypus affinis* last year, there was a total of 17 new county records, 4 for Middlesex and an extraordinary total of 13 for the county of London (as defined by the old LCC boundary). Most of these new records for London resulted from pitfall-trapping, especially on Hampstead Heath and in Brompton Cemetery. Hampstead Heath apparently benefited enormously from the relaxation of the mowing regime over large areas: several of the interesting records are from places where this has occurred; notably the Tumulus Field.

During the year a number of other sites were visited or trapped by the author, and the Society's spider forays included Bentley Priory in May and Bushy Park in December.

Some records were also provided by members including Dan Hackett and Dave Carr.

In the list below records are in taxonomic order (based on Locket et al. 1974 and the subsequent check-list updates), those marked * being new records for Middlesex, and those marked ** being new records for London.

### DICTYNIDAE

*Dictyna latens**: A single male of this small blue-web spider was swept from the old hedges at Totteridge Fields LNR.

*Lathys humilis**, **: Although not recorded in the two counties previously, in 1995 several specimens of this diminutive blue-web spider were taken during the year at three separate sites, Bentley Priory and Highgate Wood (both Middlesex) and under the ancient gorse bushes at Hatchett's Bottom on Hampstead Heath.

### OONOPIDAE

*Oonops pulcher:* Although shown by Locket et al. (1974) as having been recorded from Middlesex, no specific localities were known until this year when this common but easily missed tiny orange spider was taken (unusually) in a pitfall-trap at Highgate Wood.

### ZODARIIDAE

*Zodarion italicum***: This recent arrival is known from several sites in Essex, Kent and Middlesex, but in 1995 was first recorded in London at Brompton Cemetery where it was found to be fairly common throughout most of the year. It may be significant that the three known sites for this spider in the London Area (Bromptom Cemetery; Railway Triangle, Tottenham; and the Parkland Walk Extension) are all adjacent to railway lines, so it is assumed that trains may play a part in the distribution of this spider.

### GNAPHOSIDAE

*Drassylus pusillus**: An adult female and some immatures of this black myrmecophilous spider were found in the grass around anthills at Bentley

Priory during the Society's spider foray. It also occurs in Richmond Park, but appears to be replaced in London by *Zelotes latreillei* and less frequently by *Z. apricorum.*

## CLUBIONIDAE

*Cheiracanthium erraticum***: This attractive mouse spider with a deep red dorsal stripe on its abdomen was found on West Heath (Middlesex) last year (Milner 1995). This year a female was taken from thistles on the meadow above the ladies' swimming pool near the centre of Hampstead Heath (London). It is an inhabitant of tall herbs and could be expected to benefit from the more relaxed mowing regime now in place over most of Hampstead Heath.

*Agroeca proxima***: Several males of this uncommon mouse spider were taken at Brompton Cemetery. The only other London locality is Barnes Common where it occurs frequently. Early records in London for this genus were all *A. brunnea* which has not been recorded in London for at least forty years, although it is known from Coldfall Wood (Middlesex).

*Agroeca inopina**: This mouse spider is even less common than *A. proxima*; it has a much more southerly distribution than *A. proxima* with most records from the southern third of England and Wales. The only previous London record was from Barnes Common in 1990. In 1995 males were taken in grass at Brompton Cemetery and by Dan Hackett from tussocky grass on old railway sidings at Railway Triangle, Tottenham. The latter is the first record for this species in Middlesex.

## THOMISIDAE

*Xysticus kochi***: This uncommon crab-spider is distributed over much of the British Isles, and is known from two localities in Middlesex, but this year was taken for the first time in London; single females were taken in Buckingham Palace Garden and in a pitfall-trap in a mixed grass sward on the west side of Kite Hill on Hampstead Heath.

## SALTICIDAE

*Heliophanus flavipes***: A single female of this attractive small jumping spider was taken in a pitfall-trap in short grass on the slopes above the Vale of Health just below the *Atypus affinis* colony.

*Marpissa muscosa:* There have been a number of records for this large and rather spectacular jumping spider from inside houses in north London; its normal habitat is thought to be on the bark of trees where it is well camouflaged. However, Dr Elizabeth Young of Muswell Hill sent me an adult female which she had found in a silk cell behind curtains in her centrally heated house in November. Two possible conclusions seem to be in order; that this spider appears to hibernate or certainly to overwinter as an adult, and secondly that it may be capable of living its whole life indoors. Further observations would be of great interest. Perhaps it is becoming adapted to life on the inside of windows?

*Euophrys aequipes:* This tiny brown jumping spider is not a new record for London having been recorded from the Cripplegate bomb-site in the 1940s. However, until this year it had not been seen for fifty years in London. In 1995 a number of individuals of both sexes were taken in short grass near the *Atypus* colony, on East Heath near the Pryors (both Hampstead Heath), and also in Brompton Cemetery.

## LYCOSIDAE

*Pirata hygrophilus***: This slightly sooty wolf spider is almost as widespread nationally as *P. piraticus*, but until 1995 had not been recorded from London. Two males were taken from the Stock Pond Marsh in a pitfall-trap in June. This marsh has been diminishing in size due to the gradual shading by trees, but late in 1995 action was taken by the Corporation of London to fell some of the offending hornbeams and it is to be hoped that this important marsh will be rejuvenated. There may be colonies of *P. hygrophilus* in the marshy areas upstream (in the grounds of Kenwood House) that are managed by English Heritage, but these have yet to be investigated.

## AGELENIDAE

*Coelotes atropos**:* Perhaps the most spectacular find in 1995 was the discovery of this large spider in the Stock Pond Wood on Hampstead Heath. While it is a widespread species nationally, it is replaced in the London area by the closely related *Coelotes terrestris. C. terrestris* occurs (sometimes in very large numbers) in relics of ancient woodland (including Oxleas Wood, Queen's Wood, etc.) that have had constant management allowing the natural decay of large fallen trees and branches, natural glades, etc. Interestingly it appears to be absent from Highgate Wood, where for a long time dead wood was consistently 'tidied up' and removed.

There is no known colony of *C. atropos* for at least 20–30 miles in any direction from the Stock Pond Wood, while the nearest *C. terrestris* colony is only about a mile away in Queen's Wood. Why *C. atropos* should be there, and how long it has been there, are mysteries. It could have been overlooked before, but it is a large spider and it has not appeared in traps anywhere else on the Heath although suitable habitats have been trapped for some time.

## ARANEIDAE

*Araniella opistographa**:* This species is very similar to *A. cucurbitina* and has certainly been confused with it in the past. Since the two species are now recognized, there have been only a few records for *A. opistographa*, but one of these was a single male swept from long grass in Brompton Cemetery in May, the first record for London. More specimens of these two spiders are needed so that their identities can be checked and their relative frequency in the London area assessed.

*Hypsosinga pygmaea**:* This small orb-web spinner has an unmistakable black-and-white stripe pattern on the abdomen. A single female was taken in a pitfall-trap in the middle of Tumulus Field on Hampstead Heath in May. This is near the centre of the Heath, and it is one of the areas where the mowing had been relaxed. Long grass would appear to be the natural habitat of this species, and possibly with the increase of this habitat on the Heath it is a species that could be expected to benefit from this.

## LINYPHIIDAE

*Porrhomma errans**:* A single female of this pale money spider was taken in a pitfall-trap in Buckingham Palace Garden in September.

*Agyneta conigera**:* A single female of this regionally uncommon money spider was taken in August in dense litter under the ancient gorse bushes above Hatchett's Bottom on Hampstead Heath.

*Agyneta decora:* This northern species, common on moorlands and mountains, was previously very uncommon in the London Area, there only being records from Bostall Heath (London) and Coldfall Wood (Middlesex). However, in 1995 specimens were trapped at seven separate places on Hampstead Heath, including on Sandy Heath, the *Atypus* slope, Kite Hill and the Tumulus Field! On Tumulus Field over 60 specimens were taken from May to October. Again the relaxed mowing is taken to have been a major factor.

*Centromerus incilium**:* This Nationally Notable species was recorded from two sites in London; single males were taken in February at Brompton Cemetery, and in November from Tumulus Field on Hampstead Heath.

*Lepthyphantes obscurus:* This small northern species has been recorded from both London and Middlesex, and was recorded from Hampstead Heath by

Russell-Smith (1978). However it is very uncommon on the Heath, and in several years' trapping in different parts of the Heath the writer had not taken a single specimen until this year when a single female was taken in a trap near the *Atypus* colony in August.

*Lepthyphantes insignis:* In the London Area this Nationally Notable species has only been reported from Hampstead Heath (East Heath) where it occurs frequently, and from Barnes Common. In 1995 both sexes were trapped on the *Atypus* slopes above Hatchett's Bottom, and a single male was trapped in Hyde Park, actually inside a wooded enclosure, but just a few metres from the grassy area known as The Meadow.

## Acknowledgements

I wish to thank Dave Carr and Dan Hackett for providing records, Dr Peter Merrett for identifying many of the specimens, and the authorities responsible for managing sites where collections have been made, especially the Royal Parks, Corporation of London and Paul Canneaux (Hampstead Heath). The records from Buckingham Palace Garden are part of an ongoing survey being carried out by the Society for the Crown, and I wish to thank Mark Lane (Head Gardener) and Buckingham Palace Adminstration for permission to publish these findings.

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# Survey of Bookham Common

## FIFTY-FOURTH YEAR

## Progress Report for 1995

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### **General** (Ian Menzies, Chairman, Bookham Common Survey)

By contrast with 1994 when studies were held back by the unsettled weather, 1995 with its unusually hot dry summer has been an interesting year for natural history at Bookham Common. During the hundredth year of National Trust management the focus has been on clearance of fish from the Isle of Wight and Hollows Ponds, undertaken with the help of the National Rivers Authority. As mentioned by the Warden, Ian Swinney, in his management report, overstocking with common carp was thought to explain the impoverished state of vegetation and fauna, especially in the IoW Pond, and we now await the verdict of ecological progress during the next few years. Clearance of scrub and selective thinning of the trees has already produced an obvious improvement in ground flora and fauna in many overgrown areas of the Common by allowing sunlight to penetrate an otherwise dense canopy, but it is hoped that those who find it difficult to accept the sacrifice of any tree will realize the importance of this policy, which is not to be confused with that of 'clear felling'. This year the Botany Group have initiated a project to study the impact of scrub clearance on ground vegetation in the Bayfield Plain area, and we look forward to hearing their findings.

Reports for 1995 include: management (Ian Swinney, warden), vegetation (Ken Page), wild service tree (Bryan Radcliffe), mammals (Ian Swinney), birds (Ron Kettle), dragonflies (Ruth Day), butterflies (Ken Willmott), and beetles, bush-crickets and other insects (Ian Menzies). There are, of course, many other aspects of natural history awaiting attention on Bookham Common. Acquisition of further assistance, either to promote existing or establish new fields of interest, is, as usual, a high priority and would be very welcome.

In 1995 we saw the implementation of 'Bookham Common Study Days', and several of these dealing with a variety of different subjects have been organized and led by members of the LNHS Study Group. Starting on Saturdays at 10.30 am (shortly after the arrival of the London train at Bookham Station) these are intended to promote interest in the excellent range of natural history available at Bookham and to supplement the informal field meetings which take place on the second Saturday of each month throughout the year. Collection and publication of information fosters interest, and the increasingly serious attention paid in recent years to Bookham Common by natural historians, especially entomologists, is largely to the credit of the London Natural History Society's Bookham Study Group.

Notable observations arising from the 1995 Survey include evidence that badgers are thriving, an increase in the number of nests in our heronry and in the prevalence of the turtle dove. With regard to insects there has been evidence of the return of the silver-washed fritillary butterfly, virtually absent since the 1950s, an increase in the small copper population which had dwindled to very small numbers, also the presence of the purple emperor, white admiral and white-letter hairstreak butterflies has been well sustained. Twenty-one species of beetle not previously recorded from the Common have been discovered, mainly in the pond areas. The long-awaited appearance of Roesel's bush-cricket and further extension of long-winged conehead distribution has taken place, both insects now being well established in grassy areas on the Central, Bayfield, IoW and Western Plains. Notable botanical discoveries include that of *Rosa × pseudorusticana* and of greater spearwort.

Finally, it should also be mentioned that the grass snake *Natrix natrix* has been seen more frequently than in recent years, one on Bayfield Plain (8 April), another swimming in the shallow water of Lower Eastern Pond (22 July), and a further one trying with great difficulty to escape (from IM) over the surface of liquid mud at the Western Hollows Pond (11 September).

## **Management** (Ian Swinney, National Trust Warden)

The main effort of Bookham Common management this year has concerned the ponds and wetlands. Particular attention has been paid, as our centenary project to celebrate 100 years of The National Trust, to the restoration of the Isle of Wight Pond through which water flows after passing through a chain of four other ponds, Upper and Lower Eastern followed by the East and West Hollows Ponds.

The vegetation in IoW Pond has never recovered from the desilting carried out in 1972, but this is considered largely due to introduction of fish shortly afterwards. As a result of the unauthorized stocking of East and West Hollows Ponds, following clearance of willow carr in 1977, successional development of all three ponds has been slow. The process of silting has steadily continued and may even have been accelerated by disturbance of the muddy beds of the lower three ponds due to large numbers of carp.

The National Trust have not felt free to commence any work on Upper and Lower Eastern Ponds until the lower three are in a more advanced state of vegetative succession. Ideally the maintenance of such a chain of ponds is best if undertaken in selective rotation over a long time-scale so that efficient recolonization can take place. Long-term rotational management policies also help to maintain the ecological gradation needed to support a wide range of plant and animal species.

As fish overpopulation appeared to be the major factor responsible for turbidity and poverty of vegetation, a decision was taken to clear the IoW pond of introduced fish. With NRA consent approximately 350 lbs of fish were netted (a small area being electro-fished) and transferred to an angling establishment in Kent. The species consisted of common carp *Cyprinus carpio* (90 per cent), crucian carp *Carassius vulgaris* (<1 per cent), bream *Abramis brama* (<2 per cent), rudd *Scardinius erythrophthalmus* (3 per cent) and some pike *Esox lucius*. We were aware of the presence of pike, but did not realize there were eight, one of these being over 16 lb in weight, which could explain certain overnight losses of goslings and ducklings! The fish removal exercise was also very fortuitous and as a leak in the IoW dam lowered the level drastically and we would have had to rescue them anyway. Oak trees around the pond have also been thinned and some of the willows coppiced to let in more light and encourage the growth of vegetation at the water margin.

The results of these operations are already showing: the water is now clear, small freshwater invertebrates are visible at the pond edges, and water crowfoot, celery-leaved buttercup, water plantain and yellow flag are appearing. A new raised timber walkway, constructed across the marshy area at the inlet to IoW Pond, provides access for visitors to view these areas without trampling them, and also helps to keep the south margin of the ponds undisturbed for wildfowl.

Further clearing on Bayfield Plain has helped to increase the area of species-rich unimproved grassland. Clearance has been on a smaller scale than last year and has concentrated on thinning the large amount of young birch and *Salix* that has invaded so rapidly.

Mowing of bracken (on Bayfield and Eastern Plains) has continued and hand-pulling of Himalayan balsam has been necessary in the Mark Oak area, south of Sheepbell Pond.

The National Trust wishes to thank all members of the LNHS Bookham Common Survey: their work has ensured that the natural history of this interesting area of countryside is one of, if not *the* best recorded in the country.

### **Vegetation** (Ken Page)

In last year's report we promised a description of the rare *Agrimonia* hybrid *A. eupatoria* × *A. odorata*. Since then, the finding of this rare plant has been communicated to Professor Stace who, because of its rarity in the British Isles, considers that a cytological investigation should be carried out. Consequently, a root cutting is to be sent to Leicester University where they are prepared to undertake this work.

A rose hybrid, new to the Common, has been discovered by Peter Coxhead. This cross between *Rosa arvensis* and *R. stylosa* is known as *R.* ×*pseudorusticana*. Elizabeth Norman kindly sent a specimen to The Revd A. L. Primavesi for determination. We thank him for his promptitude and explanations regarding certain aspects of this plant.

Clearly this rose has avoided detection for a very long time. It is now a thicket about twenty metres long and five metres across at its widest end. It has also grown upwards some ten metres into nearby oaks and hawthorns. This ascending habit resembles the *R. stylosa* parent, whereas the foliage and wine-red new shoots are very indicative of *R. arvenis*. Perhaps the most striking feature is the malformed fruit that appear to be mostly sterile. Also distinctive is the slightly conical disc and the style only partly protruding — both intermediate characters.

The following two newcomers are almost cetainly introduced:

*Ranunculus lingua* greater spearwort is well established in one of the wetter areas in the vicinity of the series of ponds in division N. This handsome buttercup is not considered native in this part of Britain and has probably been planted by a 'misguided gardener' who visits the Common. Despite the criticism it looks pleasing in this particular habitat. It was found by Ian Swinney.

*Caltha palustris* kingcup, not far away on the edge of the Isle of Wight Pond, is becoming naturalized. It is large flowered and vigorous and is probably a horticultural variant. Perhaps the above-mentioned gardener was also responsible for this planting.

A species that the supposed gardener would scarcely be likely to plant was green-ribbed sedge *Carex binervis*, new to our records last year. There was just one clump at the margin of Tunnel Path about fifty metres north of the ponds. In recent years this part of the path has almost become a tunnel with overhanging trees and deepening gloom. *C. binervis* can only survive in the unlikely event of the habitat becoming more open.

### **Interim report on planted service tree** (Bryan Radcliffe)

Nigel Davies, who was Keeper in 1977, obtained a small sapling of wild service tree from the adjoining Bank's Common and planted it in the Bookham Survey Area in Central Wood at Castell reference 554. In terms of present-day ordination the location was TQ 1255 5636. Prior to the planting the area had been partially cleared by coppicing understorey shrubs (hazel, holly, sallow, etc.) but nearby standard oaks, ranging in age from some 50 to 150 years had been left untouched.

The Survey Team decided to monitor the development of the tree by annual measurement of height and of trunk diameter at one metre above ground. In January 1996 (our regular month for measurement) it had attained a height of almost 10 metres and was seen to be a fine shapely specimen with a conical crown.

Full details will be published in due course when the investigation is complete, but the following milestones in the development of the tree may be of interest:

1985 The single leading shoot bifurcated.

1987 Sucker growth commenced from some of the roots. All suckers observed were within the canopy circle of the tree. They did not grow more than about 60 cm high and lasted only a single season before disappearing. They appear to be browsed off, probably by roe deer. New suckers are regularly seen in the growing season.

1989 Flowering commenced.

1990 Fruiting commenced and has occurred annually since. No seedlings have been seen and we have not yet tested the viability of the seed.

It is noted with some surprise that the yearly increase in height and diameter have been substantially uniform over the last twelve years. Graphs of both height and diameter versus time exhibit a straight line relationship with only minor deviations. During this period the annual height increment has been 48 cm (19 in) and the annual diameter increment 8.7 mm (1/3 in).

We intend to continue monitoring the progress of the tree in the future.

## **Mammals** (Ian F. Swinney, National Trust Warden)

Apart from a survey of the rabbit warrens by French (*LN 59*, 1980: 66–72) and a series of brief reports on mammals until 1989 by the late Geoffrey Beven (*LN 69*, 1990: 136–137), there is little other information available concerning the mammals of Bookham Common. Consequently I have been asked to produce an update report. Although living 'on site' is a distinct advantage, few detailed notes are available to me and further work is needed. This could provide a useful project for a zoology student and would receive support and assistance from The National Trust.

Mammals can be very frustrating to study, the main problem being high mobility and an instinctive desire to avoid discovery which, together with highly developed hearing, sense of smell and often an ability to detect the ground vibrations, combine to defeat the approaching observer. Though casual sightings are usually restricted to the occasional fleeting glimpse, patience can be rewarded by a useful insight into habits and distribution.

The mole *Talpa europaea* appears over most of the Bookham Common area, the burrows being very obvious in grassland, but in uncompacted woodland soil tunnels show only where they cross a path and the soil becomes raised.

The fox *Vulpes vulpes* appears to be plentiful, the call of the vixen being familiar at Bookham during autumn and winter. Dog foxes advertise their territory by leaving faecal deposits in prominent sites, one such marking on Central Plain was seen to contain large claws of a signal crayfish — evidence of both the boundary of a territory and adaptability to local food sources. A neighbouring gamekeeper shot 80 foxes on a 350-acre area of woods and farmland some years ago. This was followed by a prompt recovery in population density demonstrating the ability of this species to compensate either by rapid breeding or influx from surrounding areas. Arrival of up to half a dozen young males has been known to follow the removal of one dominant male.

Despite occasional raids on the ducks and chickens at the Isle of Wight enclosure, foxes are welcomed as an important and interesting part of the ecosystem. Relationships between predator and prey determine numbers thoughout the year, and it is important to realize that the fox may have a difficult time in winter when food is scarce. Availability of food is an important factor and it is estimated that there are probably no more than six breeding pairs on the 452 acres of the Bookham Common area. Additional individuals may also be using the area as a refuge from which they can reach surrounding farmland and villages, and some certainly inhabit the railway embankment where the soil is better drained, using the Commons as a feeding ground. Foxes have recently been observed once again chasing rabbits, formerly an important part of their diet, near Merritt's Cottage and on Central Plain.

The badger *Meles meles* has been sighted much more frequently during 1995 than in the previous few years, and there are now several small setts. Unfortunately a real danger of interference still exists which makes it unwise to divulge exact locations. Evidence of feeding, clear footprints and dung have been found at many locations, and the presence of badger hair, which is very distinctive, together with fresh bedding, confirms recent usage of the holes in question. One unusual badger sighting was made at 11.30 one morning in 1989 in the vicinity of Bookham Station by a fencing contractor. Daylight sightings are sometimes made shortly after dawn, but on this occasion misjudgement or disturbance (? by dogs) may have been responsible for such an unusual timing.

Roe deer *Capreolus capreolus* have had a significant impact on the vegetation of the Commons. Evidence of their presence in the Bookham Common area has increased during the last 25 years from the occasional glimpse and some footprints to everyday sightings. In the early seventies the field layer of the woodland areas consisted of bramble to a height of two or three feet, but this has recently been reduced by roe to a very thin single strand and conspicuously eaten growth.

One theory for the increase in the range of roe has been linked to myxomatosis. Deer usually browse the taller vegetation and also require substantial grass and scrub cover for themselves and their offspring. Myxomatosis indirectly brought about conditions that were advantageous to the roe deer, and the return of the rabbit population during recent years might be expected to reverse this process. In fact during the last two years there have been noticeably fewer sightings of roe associated with an increase in bramble, especially near the car parks where disturbance by dogs is greatest.

There has also been a steady increase in the number of dogs being walked on the Commons in recent years, possibly as a result of regulations concerning hygiene being introduced in recreation grounds and other alternative dog-walk areas. Some of the animals are not under proper control and appeals are being made to dog owners to try and limit the disturbance to wildlife generally.

The brown hare *Lepus europaeus*, said to have moved into woodland following the decline in the rabbit population, has been seen on the Common more frequently in recent years. Most of the sightings have been from Hill House Wood where the nearby farmland is suitable for breeding purposes. Observation of a young hare at Merritt's Cottage in 1981 and more-recent sightings from Eastern Wood by Ron Kettle are of particular interest as both areas are much further away from fields and open land.

The hedgehog *Erinaceus europaeus* was frequently recorded in the mid 1980s, especially around the Isle of Wight enclosure in the middle of Bookham Common area. These included many of young animals, one small individual being assisted with feeding during the autumn and winter of 1984/5. In recent years the only sightings (mainly, alas, of road casualites) have been at the edge of the Common near the village.

The stoat *Mustela ermina* and weasel *Mustela nivalis* are infrequently seen, and then usually a glimpse as they cross a footpath at speed. Their numbers probably fluctuate according to the prevalence of the small mammals and rabbits upon which they feed. Most of the sightings have been on the edge of Central and Bayfield Plains, and along the Commons Road.

The water vole *Arvicola terrestris* has been rarely seen in recent years though there still is evidence of its presence along the stream banks.

Following the cessation of fishing the common rat *Rattus norvegicus* has been seldom seen around the Isle of Wight Pond, but it is still to be found near the cottages at the Isle of Wight enclosure and at Bookham Station. Attraction to these sites is often attributable to careless feeding of livestock or failure to dispose of litter. At the Tunnel over-enthusiastic feeding of birds by day ensures a feast for the rats at night!

The grey squirrel *Sciurus carolinensis* has increased steadily, especially since 1988 when control by shooting was discontinued, and the dreys can now be seen at regular intervals of about 200 yards through the woods in winter. On the plains they are damaging oaks by ringbarking, thought to be caused by a dietary deficiency at certain times of the year. As grey squirrels can take live chicks as well as birds' eggs they could be a cause for concern where some of the rare birds are nesting.

Common dormice *Muscardinus avellanarius* have been found on several occasions during clearing and thinning operations hibernating at the bases of trees in the Isle of Wight Pond area and, in spite of relative lack of hazel and tree cover, the Bayfield Plain. On each occasion care was taken to minimize disturbance, but in one case it was necessary to relocate the dormouse together with its protective nest intact to an alternative site. A breeding nest was discovered by the High Point Path during tree surgery after the October 1987 storm. The possibility that competition for food from the high squirrel population may have an adverse effect upon the dormouse is a matter of concern.

Information about the species of bat on Bookham Common is very limited and specialist advice is required to identify them and offer advice about conservation. The pipistrelle *Pipistrellus pipistrellus* appears to be plentiful, especially in the Isle of Wight and Hollows Pond areas, and a larger species flying at greater height has also been noticed. One dead brown long-eared bat *Plecotus auritus* was found a few years ago on Stent's Path.

## **Birds** (Ron Kettle)

For the Common Birds Census in the 16-hectare Eastern Wood, nine visits were made in the breeding season. Insufficient visits were made in 1994 for valid comparisons to be made with the results for that year, which incidentally were analysed by the BTO at *their* request, not ours as last year's report suggested. So the figures in the table below, which shows the number of territories estimated for each species by the BTO in their analysis, are best compared with those for 1993:

| | | | | | |
|---|---|---|---|---|---|
| Pheasant | *Phasianus colchicus* | 1 | Goldcrest | *Regulus regulus* | 1 |
| Cuckoo | *Cuculus canorus* | 1 | Long-tailed tit | *Aegithalos caudatus* | 2 |
| Tawny owl | *Strix aluco* | 1 | Coal tit | *Parus ater* | 2 |
| Green woodpecker | *Picus viridis* | 1 | Blue tit | *Parus caeruleus* | 20 |
| Great spotted woodpecker | *Dendrocopos major* | 3 | Great tit | *Parus major* | 10 |
| Wren | *Troglodytes troglodytes* | 19 | Nuthatch | *Sitta europaea* | 2 |
| Robin | *Erithacus rubecula* | 48 | Treecreeper | *Certhia familiaris* | 1 |
| Blackbird | *Turdus merula* | 10 | Jay | *Garrulus glandarius* | 4 |
| Song thrush | *Turdus philomelos* | 1 | Magpie | *Pica pica* | 2 |
| Mistle thrush | *Turdus viscivorus* | 1 | Carrion crow | *Corvus corone* | 2 |
| Blackcap | *Sylvia atricapilla* | 3 | Chaffinch | *Fingilla coelebs* | 4 |
| Chiffchaff | *Phylloscopus collybita* | 2 | | | |

Present but not credited with a territory were mallard *Anas platyrhynchos*, sparrowhawk *Accipiter nisus*, stock dove *Columba oenas*, dunnock *Prunella modularis*, willow warbler *Phylloscopus trochilus* and marsh tit *Parus palustris*. Woodpigeons *Columba palumbus* and starlings *Sturnus vulgaris* nested but were not censused. There is some evidence that two pairs of marsh tits had territories on the edge of the plot and that treecreepers were under recorded.

The BTO commented that there was very little change over the two years, but robins increased notably to the best total since 1979 and the great tit total of ten is the lowest ever. The number of blackcap territories was two less than the five in 1993, but that year had a higher than usual population, and the 1995 figure is typical.

The number of occupied grey heron *Ardea cinerea* nests, now in three groups, increased further to at least nine and probably ten, and the young appeared to survive better than in 1994.

There were probably six singing nightingales *Luscinia megarhynchos*, the same as last year. The whitethroat *Sylvia communis* population was also at the same high figure, with 11 or 12 males, while lesser whitethroats *Sylvia curruca* were again scarce with only two singing birds. Chiffchaffs were widespread in the scrub area as well as in the woodland. This year there were no records of wood warbler *Phylloscopus sibilatrix* or spotted flycatcher *Muscicapa striata*. Contrary to national trends there were more turtle doves *Streptopelia turtur* than usual, as at least five were singing in July. Three male cuckoos and a female were heard on 13 May.

A pair of swallows *Hirundo rustica* nested in an outbuilding by the Warden's house. There was more than one report of a roding woodcock *Scolopax rusticola*. A pair of sparrowhawks was seen in Eastern Wood on 1 April and a female on the 12th, but the only subsequent sighting known was of one flying NE over the Isle of Wight on 20 May. Large parties of jackdaws *Corvus monedula* are often seen flying over the Common but, apart from seeing birds putting sticks in the chimney-pots of two houses and in a tree in South East Wood, it is not known where they nest. On 21 and 25 May, there was a big flock in the tree-tops, and on the second date a lot of rooks *Corvus frugilegus* flew noisily across towards the south-east. There was a pair of stock doves in South East Wood again, and at least one bird was present in the usual spot in Eastern Wood.

Wagtails are not very often seen on the Common, but this year a pair of pied wagtails *Motacilla alba* was collecting food at the Tunnel car park on 21 May, and a family was seen on 21 June, while a grey wagtail *Motacilla cinerea* visited Upper Eastern Pond on 20 July. There were welcome observations of linnet *Carduelis cannabina* and redpoll *Carduelis flammea* in the autumn and of two singing male reed buntings *Emberiza schoeniclus* in the summer.

The ponds were almost completely dry at the end of the summer, but earlier there were at least five broods of mallards, two of mandarin ducks *Aix galericulata*, four of moorhens *Gallinula chloropus*, including one on the Bayfield Pond, and two of coots *Fulica atra*.

The Common had its share of the redwing *Turdus iliacus* invasion at the end of the year, with 60 on 31 December.

Thanks are due to Peter Crook for observations made during monthly 'standard walk' counts which he is carrying out across a variety of habitats. These have proved to be very interesting and will be valuable for monitoring changes as the years go by. Thanks are also due to Nick Murphy for a census of warblers and some other species on the scrub-covered plains, for occasional help with the woodland census and for contributing many records to this report.

## **Dragonflies in 1994 and 1995** (Ruth Day)

Unpredictable summer weather in 1994 and 1995 made it impossible to continue with my mark/capture survey — just as it had in 1993 (Day 1994).

I made eleven visits to Bookham Common in 1994, but only four in 1995, including a Study Day on 19 August, when no detailed recording was done.

May 1994 was mainly overcast and cold. Sunday 29 May, however, was sunny and I saw four pairs of *Pyrrhosoma nymphula* ovipositing at South-East Pond, as well as two single male, and four male *Coenagrion puella.* I also collected *C. puella* exuviae from the *Sparganium.* On the same day I saw two pairs of *P. nymphula* in tandem and two single males of the same species at Kelsey's Pond. Clearly *P. nymphula* is not now confined to Sheepbell Pond, but is present at most of the ponds on the Common though in low numbers.

The main emergence of *C. puella* seems to have been at the end of June. On 28 June I netted and marked 41 male *C. puella* at South-East Pond where I also saw two male *P. nymphula,* one male *Libellula quadrimaculata* and a male *Anax imperator.* South-East Pond was full of water, the *Glyceria fluitans* had died back and the pond gave every impression of having recovered. *C. puella* of both sexes were also present at Lower Eastern Pond that day, some in copula, though they seemed less abundant than at South-East Pond. Also seen at Lower Eastern Pond were two *A. imperator,* six male *Libellula depressa* and two male *L. quadrimaculata.* At East Hollows Pond there were two male *Orthetrum cancellatum* as well as a patrolling male *A. imperator,* two male *P. nymphula* and a few *C. puella.* West Hollows Pond also had its guarding emperor *A. imperator,* a male *L. depressa,* a few *P. nymphula* and a single male *Calopteryx splendens.*

On 12 July male *C. puella* were still abundant at South-East Pond where a male *A. imperator* patrolled while a female oviposited. There was still one male *P. nymphula,* and two immature male *Sympetrum sanguineum* had appeared. The same species were present in similar numbers at Kelsey's Pond (apart from the *P. nymphula*). Sheepbell Pond, however, had its solitary male *P. nymphula,* a few *C. puella* and the first *Aeshna cyanea* of the season, a male, while there was an emperor male, *A. imperator,* and a male *Aeshna grandis* at Lower Eastern Pond.

The main emergence of *Lestes sponsa* appears to have been between the end of July and the beginning of August, but they were not as abundant as in previous years. The most males I netted on any one day was 20 at Lower Eastern Pond on 2 August when the weather was overcast as it was for so much of the summer.

*Sympetrum sanguineum* continued abundant and possibly increasing on the Common, and *A. imperator* was now ovipositing in Bayfield Pond as well as Kelsey's and South-East. On my final visit in 1994 on 10 September I added *Aeshna mixta* to my season's species list, having observed two males flying over the bridle path between Bank's Common and Bookham Common.

My first visit in 1995 was on 21 May. The weather was overcast and there were no Odonata on the wing at all. Netting yielded *C. puella* larvae from South-East Pond and *S. sanguineum* larvae from Kelsey's Pond. On 26 July *S. sanguineum* was abundant at Lower Eastern Pond despite some restrained clearance of the *Typha.* Three male and one female *A. imperator* were also present, but there was no sign of any damselflies. The 29th July was a brilliantly sunny day and I netted eighteen male *C. puella* and sixteen male *S. sanguineum* at South-East Pond. Also present at that pond were a male *A. grandis* and three male *A. cyanea.* At Lower Eastern Pond about an hour later on the same day I netted seven male *S. sanguineum* and one male *L. sponsa,* and saw one male of each *A. imperator, L. depressa* and *A. cyanea.*

By the study day on 19 August South-East and Lower Eastern Ponds had dried up, and there was very little water in Isle of Wight Pond. Kelsey's Pond, however, still had plenty of water and we were able to observe *Aeshna* and *Sympetrum* larvae there.

## Reference

DAY, R. 1994. Odonata. *In* Survey of Bookham Common, 1993. *Lond. Nat.* 73: 172–173.

## **Butterflies** (Ken Willmott)

Spring 1995 was disappointing, March having below average temperatures, April and May both deteriorating after promising starts. It was a fine summer with little rainfall overall between March and September, leading to notable drought conditions. The first full brimstone *Gonepteryx rhamni* flights took place on approximately 23 March, and they were observed laying eggs on buckthorn (*Rhamnus*) on 12 April. Larvae of the small tortoiseshell *Aglais urticae* were in good numbers on the nettles (*Urtica*) by early May and newly hatched second generation larvae were found on 5 July. The pipe-laying operations near the Tunnel car park have destroyed a good nettle area, but it is hoped they will recover in due course. Peacock *Inachis io* larvae did almost as well in 1995, although the resulting adults fuelled up and entered hibernation very early, in response to the heat and drought of the summer.

The white admiral *Ladoga camilla* responded well to the fine summer weather and was emerging strongly on 25 June when over a dozen different individuals were seen. Frequency counts on the usual ride near Hill House Farm, which I undertake annually, were down on previous yearly figures at 14 and 10 (compared with 31 and 21 in 1994), although temperatures were in the low 80s on the days selected for counting (29 June and 8 July) and this may have had an effect on the result. The 1996 count will be interesting. A single fine var. *obliterae* (formerly *semi-nigrina*) was encountered on 5 July, just a couple of minutes after a magnificent 'posing' male purple emperor *Apatura iris* was maddeningly disturbed by a horse rider as I was preparing to take photographs. The lost opportunity was redeemed by obtaining several excellent photographs of the *obliterae* white admiral which was in unusually mint condition. I think it had just emerged from the tangles of honeysuckle *Lonicera periclymenum* and was flying weakly, perhaps on its maiden flight.

The purple emperor had an average year, with spring temperatures probably determining good or bad years for this species. It was first seen by myself on 3 July, with an expedition to observe on 29 June failing to see it on its Hill House Farm territory. This was unexpected in view of the fine summer weather and as it was seen in the same territory on 30 June 1994.

Dutch elm disease seems to be slowly progressing, but I was pleased that the rate of elm (*Ulmus*) deaths appears to have diminished in some areas inhabited by the white-letter hairstreak *Strymonidia w-album*. A London Natural History Society Field Study Day on 15 July was blessed with a close sighting of a female white-letter hairstreak busily engaged in depositing eggs on the twigs of wych elm. The purple hairstreak *Quercusia quercus* had another good year and was first found, freshly emerged, on 25 June. Four days later three were seen cavorting around the tops of the purple emperor 'master' oaks at Hill House Farm.

On the same LNHS Field Study Day a couple of fine painted ladies *Vanessa cardui* were seen feeding on the knapweeds and thistles. Earlier in the year a probable early migrant, possibly even the parent of the July ones (!) was found fluttering against the glass in Merritt's Cottage porch (10 June, I. Menzies). The red admiral *Vanessa atalanta* was in reasonable numbers on the Common and, as usual, disputing territory below the purple emperor 'master' oaks on 29 June. The comma *Polygonia c-album* was observed egglaying on 25 June and again on 8 July, the former sighting being of the fine pale var. *hutchinsoni*.

The mystery of the silver-washed fritillary *Argynnis paphia* continues, with numerous sightings from different parts of the Common, but seemingly all of *males* in 1995. The first one I saw was on 5 July and three days later I had a peak of four sightings, and the final one being seen at the late date of 11 August. The Mark Oak area seems to be a favoured spot for my sightings and it is the only area where I have seen a female. Other sightings were from Merritt's Cottage, Kelsey's Pond and IoW Plain by Bank's Path (22 July, I. Menzies). Where, or if, they are breeding on the Common is unknown and could be the subject of a worthwhile project. Could they be someone's fanciful releases, in the hope of re-establishing this species on Bookham Common? If so, why is there not a proportion of females released and seen more often? The critical breeding areas of this species, which must have been formerly more commonplace, are now small and well scattered (Willmott 1994). A full survey of the violet (*Viola*) growth on the Common would be a worthwhile project and findings would be helpful in assessing conservation possibilities for this large and gaudy species.

Numbers of the holly blue *Celastrina argiolus* seem to be slowly increasing and I had three sightings on the Common during 1995. It has been at a low ebb in recent years, after its population explosion in the early 1990s. Another positive result of a good summer was a marked increase, especially later in the season, of the small copper *Lycaena phlaeas*, although the disappointing spring weather indicated little likelihood of species like the grizzled skipper *Pyrgus malvae*, dingy skipper *Erynnis tages* and wall brown *Lasiommata megera* ever recovering.

The Satyridae (or 'browns') being grass feeders in the larval stage, were negatively affected by the fine summer weather and conditions of drought. A single marbled white *Melanargia galathea* was seen again on the Common (Bayfield Plain 21 July, I. Menzies), emulating a similar observation of mine several years ago. Probably a misguided release, but the species has been spreading rapidly along the North Downs over the last decade. The flight period of the ringlet *Aphantopus hyperantus* was interestingly delayed, despite fine weather. There was no sign of them on 25 June, and only two seen on the 29th. On 26 June the previous year over a dozen were seen flying on the Common. They were seen in good numbers on 8 July 1995.

Interesting late sightings were of a male orange-tip *Anthocharis cardamines* on 25 June and a speckled wood *Pararge aegeria* on 28 October.

## Reference

WILLMOTT, K. 1994. Lepidoptera. *In* Survey of Bookham Common, 1993. *Lond. Nat.* **73:** 171–172.

### **Beetles** (Ian Menzies)

With the discovery of no fewer than twenty-one new species for our provisional list, the majority from pond and wetland areas, 1995 has been quite a notable year for Bookham Common beetles. An unusually marked and progressive fall in water levels due to hot and dry summer weather left the Lower Eastern Pond completely dry by the end of September, and reduced most of the other ponds to a mere remnant of water with a narrow muddy margin where most of the predatory wetland staphylinids, carabids and their prey became concentrated. This situation, exploited by John Owen, Roger Booth and myself, led to the discovery of sixty-four beetle species of which twenty are new to the Bookham list (Table 1).

John Owen also undertook to study the relative incidence of the various species of staphylinid beetles at the margins of Western Hollows Pond by recording the numbers of each species encountered in one hundred consecutive captures made by himself on 12 September (Table 2).

Early in the year *Anthonomus bituberculatus* Thomson, one of the hawthorn bud-weevils, was quite frequent on the old hawthorns of Bayfield and IoW Plain, six being beaten from the branches on 14 January and fourteen on 12 February, several of which were pairing. This species becomes active from

November onwards, at a time when few other insects are around, in readiness to oviposit on the hawthorn leaf-buds as they begin to expand in February and March. The brilliant metallic-green weevil *Byctiscus betulae* (Linn.) (NT1 status) was found on aspen (Eastern Plain, 6 June) and the related *Rhynchites caeruleus* (Degeer) frequented crab apple in the Arboretum and on Western, IoW and Bayfield Plains later in the year (24 August and 9 September): previous records of the latter at Bookham have been from hawthorn during April and May after overwintering.

The tiny ladybird *Clitostethus arcuatus* (Rossi) (RD1 status) was found again on 11 March, 8 April, 21 May and 11 October near the Tunnel car park where it seems to be well established on the ivy, most of which is out of reach.

Longicorn beetles usually associated with the hawthorn blossom, which appeared from 19 April onwards, were present in small numbers this year. On 7 May only two *Anaglyptus mysticus* (Linn.) (NT2 status) and very few of the usually abundant *Grammoptera ruficornis* (Fab.) could be obtained by beating blossom in optimal condition. *Saperda populnea* (Linn.), a handsome longicorn with larvae that produce conspicuous elliptical swellings along the smaller, half-inch diameter, stems of poplar and aspen, was found in small numbers only (one on 16 May, and three on 10 June, Eastern Plain and Arboretum). This species, abundant during the 1940s and 1950s, has become much less numerous in recent years. A single *Phytoecia cylindrica* (Linn.) (NT2 status), a medium-sized black longicorn beetle associated with umbelliferous plants such as hogweed, was obtained by sweeping near the Bookham stream on Bayfield Plain, 21 May (RB): this very local species has been recorded at Bookham on only a few previous occasions.

Phytophagous beetles associated with vegetation growing at the margins of IoW, Hollow and Eastern Ponds included *Chrysolina polita* (Linn.) and *C. menthastri* (Suffrian) (NT2 status), both quite numerous on the water mint (17 July, Lower Eastern Pond), also *Phyllobrotica quadrimaculata* (Linn.) (NT2 status), four seen at eastern end of IoW Pond, 10 June (RB), later becoming abundant on the skullcap *Scutellaria* around Lower Eastern and East Hollows Ponds, 17 July. *Chrysolina brunsvicensis* (Gravenhorst) (NT2 status) was seen again on square-stalked St John's wort *Hypericum tetrapterum* near Lower Eastern Pond, 14 October: this local rose-copper coloured species was found quite regularly here, and on Western Plain, during the 1980s, but declined along with its foodplant, during the early 1990s. *Donacia simplex* Fab. continues to be abundant on the branched bur-reed *Sparganium erectum* growing at the margins of most of the Bookham ponds during May and June. Although other species of reed-beetles (*D. thalassina* Germar, *D. versicolorea* (Brahm) and *D. vulgaris* Zschach) have been previously recorded from Bookham, their presence has not been confirmed in recent years. This is somewhat surprising as Bolder Mere, situated only three miles away at Wisley, currently boasts at least six species of reed beetle (*D. simplex, D. cinerea, D. vulgaris, D. semicuprea, D. thalassina* and *Plateumaris discolor*).

Several of the active, fly-like beetle *Mordella villosa* (Schrank), a local species associated with ancient woodland (NT2 AW3 status) which appears to be a new record for Bookham Common, were found visiting the flowers of *Angelica* near the Bayfield Pond on 22 July. A single example of the small bronze-coloured phytophagous beetle *Lamprosoma concolor* (Sturm.) was beaten from ivy near the Tunnel car park on 21 May (RB). This is another local species (NT2 status) that has only been occasionally recorded from Bookham Common in recent years.

*Agonum sexpunctatum* (Linn.), a very local carabid beetle (NT1 status) with spectacular rose-copper elytra and green thorax, usually found in boggy areas on acid heaths, is also a new record for Bookham this year. One was found under an oak log on 15 May (IM), and another running on ground at an old bonfire site, 21 May (RB), both in the marshy area between Eastern Hollows

TABLE 1. Beetles at mud margins of the Bookham ponds collected by Roger Booth, John Owen and Ian Menzies on 9, 11, 17, 21 and 23 September 1995.

| | **Status** | **WHP** | **EHP** | **BP** | **LEP** | **? new to Bookham** |
|---|---|---|---|---|---|---|
| CARABIDAE | | | | | | |
| *Carabus violaceus* Linnaeus | | | + | | | + ! |
| *Elaphrus cupreus* Duftschmidt | | | | + | | |
| *Elaphrus riparius* (Linnaeus) | | + | | | | |
| *Dyschirius aeneus* (Dejean) | | + | + | | | + |
| *Bembidion lampros* (Herbst) | | | + | | | |
| *Bembidion dentellum* (Thunberg) | | + | | | | |
| *Bembidion obliquum* Sturm | NT2 | + | + | | | + |
| *Bembidion varium* (Olivier) | | + | + | | | |
| *Bembidion quadrimaculatum* (Linnaeus) | | | + | | | |
| *Bembidion quadripustulatum* Serville | NT2 | + | + | + | | |
| *Bembidion doris* (Panzer) | | + | | | | |
| *Bembidion articulatum* (Panzer) | | + | + | + | | |
| *Bembidion lunulatum* (Fourcroy) | | | | + | | |
| *Pterostichus madidus* (Fabricius) | | | | | + | |
| *Pterostichus minor* (Gyllenhal) | | | | | + | |
| *Pterostichus nigrita* (Paykull) | | + | | | | |
| *Agonum marginatum* (Linnaeus) | | | + | | | |
| *Agonum sexpunctatum* (Linnaeus) | NT1 | | + | | | + |
| *Stenolophus mixtus* (Herbst) | | | | + | | |
| DYTISCIDAE | | | | | | |
| *Laccophilus hyalinus* (Degeer) | | + | | | | |
| *Laccophilus minutus* (Linnaeus) | | + | | | | |
| *Hydroporus memnonius* Nicolai | | + | | | | |
| *Agabas sturmi* (Gyllenhal) | | + | | | | |
| HYDROPHILIDAE | | | | | | |
| *Hydrochus angustatus* Germar | NT2 | | + | | | |
| *Cercyon ustulatus* (Preyssler) | NT2 | + | | | | |
| *Anacaena limbata* (Fabricius) | | + | | | | |
| *Laccobius bipunctatus* (Fabricius) | | + | | | | |
| *Helochares lividus* (Forster) | NT2 | + | | | | |
| HYDRAENIDAE | | | | | | |
| *Octhebius minimus* (Fabricius) | | | | + | | |
| *Hydraena testacea* Curtis | NT2 | + | | | | |
| PTILIIDAE | | | | | | |
| *Ptenidium intermedium* Wankowicz | | + | | | | + |
| *Acrotrichis henrici* (Matthews) | NT2 | + | | | | + |
| STAPHYLINIDAE | | | | | | |
| *Bledius gallicus* (Gravenhorst) | | | | + | | |
| *Carpelimus bilineatus* Stephens | | | | + | | |
| *Carpelimus corticinus* (Gravenhorst) | | | + | | | |
| *Carpelimus gracilis* (Mannerheim) | | | | | + | + |
| *Carpelimus impressus* (Boisduval & Lacordaire) | NT2 | + | | + | | + |
| *Carpelimus obesus* (Kiesenwetter) | RD3 | + | + | + | | + |
| *Carpelimus rivularis* (Motschulsky) | | + | + | + | | |
| *Carpelimus zealandicus* (Sharp) | | + | | | | + |
| *Platystethus alutaceus* Thomson | | + | | | | |
| *Platystethus cornutus* (Gravenhorst) | | + | | | | |
| *Platystethus degener* Mulsant & Rey | | + | | | | + |
| *Stenus boops* Llungh | | | | | + | |

| | **Status** | **WHP** | **EHP** | **BP** | **LEP** | **? new to Bookham** |
|---|---|---|---|---|---|---|
| *Stenus cicindeloides* (Schaller) | | + | | | | |
| *Stenus comma* LeConte | | | + | | | |
| *Stenus incrassatus* Erichson | | + | | | | |
| *Stenus melanarius* Stephens | | | + | | | + |
| *Stenus ossium* Stephens | | + | | | | |
| *Lathrobium geminum* Kraatz | | + | | | | + |
| *Erichsonius cinerascens* (Gravenhorst) | | | + | | | |
| *Philonthus quisquilarius* (Gyllenhal) | | + | + | + | | |
| *Gabrius pennatus* Sharp | | + | | | | |
| *Phihygra hygrotopora* (Kraatz) | | + | | | | |
| *Phihygra malleus* Joy | | + | | | | + |
| *Gnypeta carbonaria* (Mannerheim) | | + | | | | |
| *Gnypeta ripicola* (Kiesenwetter) | NT2 | + | | | | + |
| *Gnypeta rubrior* Tottenham | | + | + | + | | + |
| *Gnypeta velata* (Erichson) | NT1 | + | | | | + |
| *Brachyusa concolor* (Erichson) | NT1 | + | + | | | + |
| HETEROCERIDAE | | | | | | |
| *Heterocerus fenestratus* (Thunberg) | | + | | | | |
| CURCULIONIDAE | | | | | | |
| *Litodactylus leucogaster* (Marsham) | NT2 | + | | | | |
| *Phytobius canaliculatus* Fahraeus | | + | | | | + |
| *Sibinia primitus* (Herbst) | NT2 | + | | | | + |

Location
WHP = West Hollows Pond
EHP = East Hollows Pond
BP = Bayfield Pond
LEP = Lower Eastern Pond

Status
NT2 = Notable B or Local
NT1 = Notable A or Very Local
RD3 = Rare
RD2 = Rare and Vulnerable
RD1 = Very Rare and Endangered

AW1 } Ancient
AW2 } woodland
AW3 } categories

TABLE 2. Relative incidence of staphylinid species from 100 specimens collected by John Owen, West Hollows Pond, 21 September 1995.

| | |
|---|---|
| *Carpelimus obesus* | 39 |
| *Carpelimus rivularis* | 11 |
| *Platystethus cornutus* | 1 |
| *Stenus incrassatus* | 3 |
| *Philhygra malleus* | 3 |
| *Gnypeta rubrior* | 32 |
| *Gnypeta rupicola* | 7 |
| *Gnypeta velata* | 3 |
| *Brachyusa concolor* | 1 |

and Lower Eastern Ponds. A single *Carabus violaceus* Linn., the violet ground-beetle, was found under a log in the same area on 24 August: surprisingly this common species does not appear to have been recorded previously for Bookham!

*Agrilus pannonicus* and *A. viridis*, both regarded as a very rare species (RD2 status), appeared on Bookham Common in association with trees damaged by the October 1987 gale, *A. pannonicus* selecting oaks and *A. viridis* sallows. Both these species of jewel beetle were then quite frequently found during June and July, in various areas of Bookham Common, for about five years. However, numbers have subsequently declined, and neither species was seen in 1995.

## **Bush-crickets** (Ian Menzies)

Roesel's bush-cricket *Metrioptera roeselii* (Hagenbach). Apart from the discovery of a single male stridulating on the Western Plain three years ago, the steady extension of this species in Surrey during 1993 and 1994 did not include Bookham Common. In 1995, however, a nymph was found on Bayfield Plain during May and, when the species reached the adult stage by the end of July it became evident that Roesel's bush-cricket had become established on Bayfield, Central and Western Plains where its loud and continuous stridulation dominated the fainter conehead songs.

Long-winged conehead *Conocephalus discolor* (Thunberg). This species has also increased its numbers and range on Bookham Common since 1994, strong colonies being present in grassy areas on Central, Bayfield, IoW and Western Plains.

Short-winged conehead *Conocephalus dorsalis* (Latreille). Unlike *M. roeselii* and *C. discolor*, the short-winged conehead has undergone a decline in numbers and distribution. It could only be found on the Western Plain in 1995.

It is interesting to note the difference in response of Roesel's bush-cricket and the long-winged conehead on the one hand, and the short-winged conehead on the other, apparently to the unusually warm dry summer of 1995. Whereas the former two species favour dry grassy fields, the latter normally prefers marshy areas with *Juncus* and *Phragmites* which dried out during July and August 1995.

## **Miscellaneous insects** (Ian Menzies)

*Laothoe populi* (Linn.) poplar hawkmoth, *Cerura vinula* (Linn.) puss moth, *C. hermelina* (Goeze) poplar kitten, *Notodonta ziczac* (Linn.) pebble prominent, *Pheosia tremula* (Clerck) swallow prominent, *Pterostoma palpina* (Linn.) pale prominent, and *Clostera curtula* (Linn.) chocolate-tip larvae were frequently beaten, during June and again during August and September, from aspen, especially the abundant growth of saplings on Eastern Plain, and the black poplar hybrids in the Arboretum. A fully grown and distinctively handsome larva of the dark dagger moth *Apatele tridens* (Schiffermüller) was found on sapling sloe, IoW Plain, 12 August.

*Brephos parthenias* (Linn.) orange underwing moth, was seen flying in sun over birch, Bayfield Plain, along with the spring butterflies, on 8 April.

*Drymonia ruficornis* (Hufnagel), lunar marbled brown moth. A female beaten from oak by Tunnel car park, 15 April.

*Tethea or* (Schiffermüller) poplar lutestring: 21 May, adult moth beaten from black poplar hybrid, Arboretum.

*Nonagria typhae* (Thunberg) bulrush wainscot moth: larvae noted in stems of reedmace, Lower Eastern Pond.

*Drepana lacertinaria* (Linn.) scalloped hook-tip moth: 9 September, fully grown larva on birch sapling, Bayfield Plain.

*Gonocerus acuteangulatus* (Goeze), box pug: 24 August, nymphs beaten from hawthorn near Bayfield Pond, also from a cultivated apple 'escape' near Merritt's Cottage.

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# Danish scurvy-grass *Cochlearia danica* in the London Area

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Among the best-known examples of a plant increase in the last twenty years, i.e. since the end of the survey which was the basis for our most recent general botanical publication (Burton 1983), is the Danish scurvy-grass *Cochlearia danica*. Its spread all over Britain in recent years along the central reservation of motorways and other trunk roads is well known, and the London Area has not been spared. However there has been no attempt to document its current distribution in our area, a gap which this paper is intended to fill.

*Cochlearia danica* occurs naturally near the sea on cliff-tops, dunes and shingle beaches, from Portugal to Norway and the Baltic Sea. The nearest native population to London is (was?) at Shoebury in South Essex (vice-county 18), but the source from which it has been introduced is more likely to be from some other part of the country where it is more abundant. The most likely material with which it was originally transported away from the coast is shingle, spread over road drains. Its increase lengthwise along roads is facilitated by the spread of de-icing salt on the surface. This is used mostly in the outside lane and on hills, where the risk of skidding is greatest. Other coastal plants occur in similar situations, most abundantly reflexed saltmarsh-grass *Puccinellia distans*, but none is so frequent or so easily observed as *Cochlearia danica*.

Coastal shingle has also been used as railway ballast, which accounts for the occurrence of *Cochlearia danica* in this habitat. Two open circles on the map (Figure 1) are the only two certain records of this kind in our area, from the track alongside Scratch Wood sidings, where it was found in 1951 by Edgar Milne-Redhead and John Dony, and from King's Langley where it was found

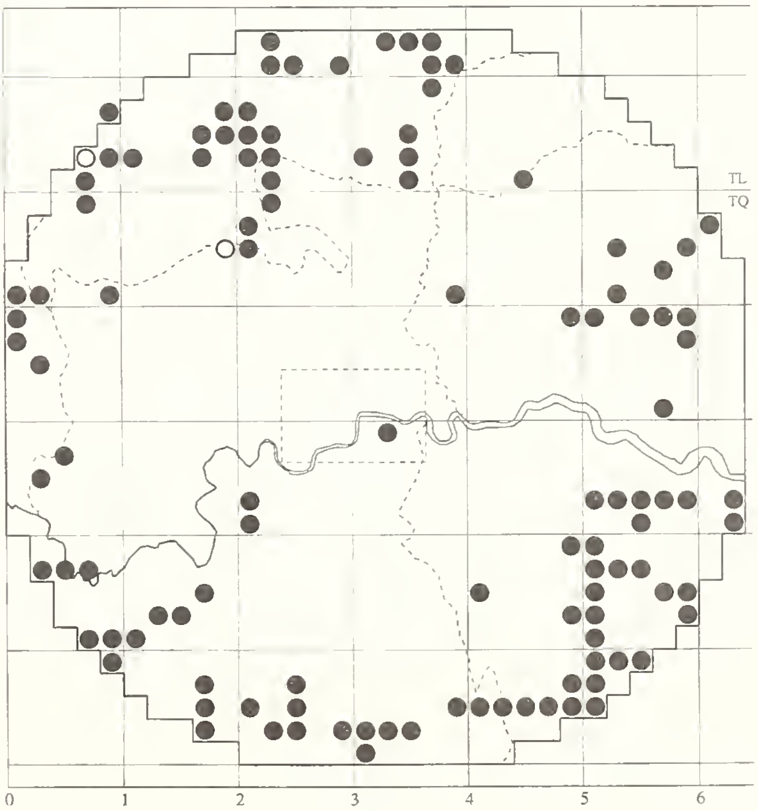

FIGURE 1. Tetrad distribution of *Cochlearia danica* in the London Area. Open circles: records before 1980. Closed circles: records after 1980.

in 1979 in the course of a survey of railway vegetation conducted for the Institute of Terrestrial Ecology. In the former locality it persisted (without the benefit of added salt!) until 1963.

All the other records on the map date from 1984 or later, though its occurrence in the roadside habitat is older than that outside our area. By the A3 on Rodborough Hill south-west of Milford in Surrey, a three-lane highway, where a large colony over about fifty yards had been discovered by D. W. Baldcock in 1968 (Lousley 1976), a London Natural History Society meeting on 24 April 1977 was shown it extending thickly over at least 500 yards. This illustrates its power of persistence and increase. It is likely to remain in all its roadside localities until there is a physical change in the habitat, like the one happening at the time of writing in the southern part of our area, where a length of M25 with a wide central reservation is being changed into a length with more-numerous traffic lanes in each direction, the two directions separated by a low concrete wall.

The circles on the map each indicate a record from a species in a 2 × 2 km square or tetrad. I would have liked to show the records on a 1 × 1 km square basis, as this would indicate better which roads the plant had been reported from, but this would have meant having to leave out several records which are not adequately localized. Adequate localization is often difficult to achieve when recording from fast-moving vehicles. (So too is confident identification. J. R. Palmer has pointed out the possibility of another *Cochlearia* sp. being present, and I have myself lost confidence in one of my own records when seeing, immediately after, a long and continuous group of even-heighted plants of chickweed *Stellaria media*).

The places from which *Cochlearia danica* has been recorded are listed below in the usual vice-county sequence. Within each vice-county the records are in the sequence **A**: M25 (this motorway is wholly within our area except for a short stretch near Byfleet, and in all our vice-counties); **B**: other motorways; **C**: other dual carriageways; **D**: other roads; **E**: other records.

## V.C. 16, West Kent

**A**: M25, in eleven tetrads, particularly abundant on the hill between Junctions 4 and 5; north of Junction 3 in one place only, on the northbound side. **B**: M26 in three tetrads, one of them a record taken from Kitchener (1996). M20 in four tetrads, three from the same source. **C**: A21 outside the M25 circle. A20, in one place west of the M25, and east of the M25 at the corner of Button Street. A2 in seven tetrads. **D**: A225 on the east side north of Farningham, within sight of the M20. North side of the A232, a small patch at the west corner of Hayes Common, far from any other known population.

## V.C. 17, Surrey

**A**: M25 in ten tetrads, from Leatherhead to the Kent border. **B**: M23 south of the M25 (it does not seem to have been looked for in the short stretch north of the M25). M3, and at the Staines Road/M3 bridge. **C**: A3, in seven tetrads with a gap in the New Malden–Tolworth area; at the A224 roundabout on the north verge as well as in the central reservation. A24, on the bends near Mickleham. A217. **D**: Parvis Road, Byfleet, on both sides. **E**: Elba Place Nature Reserve near Elephant & Castle, in some quantity on imported soil, in 1985.

## V.C. 18, South Essex

**A**: M25 in only five tetrads; there are long stretches of apparently suitable motorway where it is absent, as it is (**B**:) from the M11 outside the M25 (on the M11 inside the M25 it has perhaps not been looked for). **C**: A406 North Circular Road, on a slip-road at Waterworks Junction. A12 in six tetrads, abundant in many, and on the north verge in one place as well as in the central reservation. A127 west of the M25 (probably eastwards as well, but this seems not to have been searched).

## V.C. 19, North Essex

*Cochlearia danica* appears to be absent from the short length of M25 and from the M11 in this vice-county.

## V.C. 20, Hertfordshire

M25 in seven tetrads, and one on the spur at Junction 19. The record from north of this Junction near Langleybury has unfortunately been displaced 10 km too far south on the map, due to an author error. **B**: the only records from the M1 known to me are outside the London Area. A1(M) in seven tetrads. **C**: A414 in about seven tetrads, on the verge as well as the central reservation near London Colney. A10 in six tetrads. A405. **D**: B197 where it runs alongside the A1(M) at Lemsford. A412 near the southern corner of the vice-county, mostly on the east side.

## V.C. 21, Middlesex

**A**: M25 in the Poyle–Longford area, but not in the Potters Bar area. **B**: A1(M) in three tetrads, continuous with the Herts. population. Apparently absent from the M4. **C**: A1 at Barnet Gate. A30 in two tetrads, west and east of Staines roundabout. A308 east of Staines roundabout. A3044 west of Heathrow Airport. The records from the A30, A308 and A3044, all in 10-km square TQ07, are not shown on the map. **E**: embankment between the B375 and Halliwell Fisheries, Shepperton, with a wide assortment of other casual and weedy species.

## V.C. 24, Buckinghamshire

**A**: M25 in five tetrads. **D**: Willets Lane, New Denham.

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# Book review

***The tree sparrow.*** J. Denis Summers-Smith. Published by the author, Guisborough, Cleveland. 1995. 205 pp. £24. ISBN 0 9525383 0 X.

*The tree sparrow* is the fourth book on sparrows by the author, an amazing achievement for an amateur. It provides a comprehensive account of every aspect of tree sparrow ecology, with chapters on distribution, numbers, movements, breeding, behaviour, food and relations with man. Full of tables in the text and appendices, it summarizes research throughout the species' range, drawing on references from many countries. The book is full of interest, for instance, evidence is presented to show that tree sparrows pair for life and even roost together during the winter. More interpretation and speculation would have been appreciated given the author's immense knowledge of his subject. However, the dangers of such speculation are apparent. The author withdraws an earlier suggestion that the increase in numbers in Britain in the late 1950s and 1960s was the result of immigration of Continental birds. He now speculates that the changing fortunes of sparrowhawks might be in part responsible for the changes in tree sparrow numbers. The changes in agricultural practices are also recognized to be likely to be having a detrimental effect on numbers. It will be interesting to see if these suggestions withstand the test of time. With tree sparrows showing the largest decline of any farmland bird in this country, a chapter on their conservation would have been appreciated.

For a detailed read, I would recommend this book.

DEREK COLEMAN

# Botanical records for 1995, with a note on computerization

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## Summary

This paper presents selected 1995 records of vascular plants in the London Area. Novelties or near-novelties include in V.C. 16 *Umbilicus pendulinus*, in V.C. 17 *Hydrocotyle ranunculoides, Ludwigia palustris* and *Senecio inaequidens*, in V.C. 20 *Hypericum × desetangsii, Rumex × dimidiatus* and *Trifolium fragiferum* subsp. *bonannii*, and in V.C. 21 *Erica cinerea, Minuartia hybrida* and *Ranunculus ficaria* subsp. *ficariiformis*. It concludes with a note about the computerization of the London Natural History Society's current plant records.

## V.C. 16, West Kent

By chance, the first record to be entered on the computer database created to store the London Natural History Society's vascular plant records was also a record made in early January, one of very few records of navelwort *Umbilicus pendulinus* to be made in our area. However, that was in the modern county of Kent, and my usual practice, begun in the year when there was a comprehensive survey of Greater London to report on (Burton 1985), is to begin each vice-county section of this annual selection of the most interesting records made in its recording area, a circle of 20-mile radius centred upon St Paul's Cathedral, with that part of the area which is in London boroughs. It is also convenient to distinguish the inner from the outer boroughs in each vice-county.

From the inner Kentish boroughs, the most remarkable 1995 record received was surely Mathew Frith's cowslips *Primula veris*, a colony of about ninety plants known in fact for some years on a grassy roadside bank near to Honor Oak Crematorium, and only just east of the old boundary with Surrey as used for botanical records, mapped by me recently (Burton 1994: 213). From the information supplied to me by Mr Frith, my conclusion is that this is most likely to be a relic native population, like those in railway cuttings in a few places in London. Also in the Borough of Lewisham, I was pleased to note myself the continued presence on or around Blackheath of little mouse-ear *Cerastium semidecandrum*, fiddle dock *Rumex pulcher* and soft clover *Trifolium striatum*.

In the Borough of Bexley, most of the 1995 records entered on the computer arise from our meeting to Crayford Marshes on 1 July, led by Geoffrey Kitchener, whose earlier reconnaissance had brought to light plants of the hybrid of great mullein and dark mullein *Verbascum × semialbum* near the Darent tidal barrier, and other interesting plants, of which I will mention hairy buttercup *Ranunculus sardous*, a locally abundant native species in this region and nowhere else in London, in preparation for further mentions of it to come. Earlier in the year I went to look at a tree at the corner of Foots Cray churchyard, which I must have passed many times about thirty-five years before when I lived near, to which I was directed by Alan Young; it is the first record from the borough of the true black poplar *Populus nigra* subsp. *betulifolia*, a venerable female specimen. Our records from the larger Borough of Bromley are correspondingly more numerous. The most unexpected of Mr Kitchener's are various horticultural bulbous plants observed near Crofton Heath; at the edge of Sparrow Wood there were at least forty plants of American onion *Allium unifolium*, and in a wood near allotments about half a mile away small numbers of garden tulip species, *Tulipa kaufmanniana* Regel and *T. greigii* Regel, garden grape-hyacinth *Muscari armeniacum*, garden summer snowflake *Leuocojum aestivum* subsp. *pulchellum* and three-cornered garlic *Allium triquetrum*. Geoff Bird, who might have been excused for thinking that after his own earlier investigations it would be impossible to add to the flora of this area, himself found yellow-sedge *Carex viridula* subsp. *oedocarpa* in Roundabout Wood. Joyce Pitt continues to give good reports of Ravensbourne Meadows north of Keston Common, which are evidently benefiting from careful management by Bromley; in 1995 there were at least twelve clumps of common sedge *Carex nigra* and masses of ragged robin *Lychnis flos-cuculi* and marsh-marigold *Caltha palustris* in the very wet central field, and prickly sedge *Carex muricata* in the dry acid heathy bits at the north end.

Reverting to the record of *Umbilicus* mentioned earlier: John Palmer and Eric Philp found a very few plants of it on a shaded wall in Farningham, the first record ever from the Kent part of our area. This occurrence, near but not in a garden, is extremely puzzling; on the one hand, the wall in question is on the line of a much-walked long-distance footpath, and I have myself passed it many times without noticing the plant, so there is a presumption that it may have been deliberately introduced, and on the other hand my own attempts at introducing the species in a similar situation have all been dismal failures. In the heat of summer the living population was reduced to a single leaf, but it revived to its former size at the end of the year. Other 1995 records of Mr Palmer's include a number of widely scattered plants of the Hyères tree-mallow *Lavatera olbia*, a shrub which has become very popular in gardens in the last ten to fifteen years, being easily established, in the south part of Dartford Heath; meadow saxifrage *Saxifraga granulata* at Westminster Fields, Horton Kirby, where it may well have been destroyed subsequently in the name of management for nature conservation; true spinach *Spinacia oleracea* as an abundant relic of field cultivation between Farningham and Horton Kirby; and on a site near Swanley used many years ago for the sale of small plants in pots, but now totally derelict, a variety of established garden plants including *Erodium manescavi* and *Eryngium variifolium* which I have myself found set viable seed very readily in cultivation, as well as Tintern spurge *Euphorbia serrulata* which is not much grown. He independently found a Mediterranean annual *Scrophularia peregrina* as a weed in Dartford, reported as having been seen by Mervyn Brown in *The Bulletin of the Kent Field Club*, and confirmed the discovery by Alan Lewis of Cobham Resource Consultants of longleaf *Falcaria vulgaris* growing on building rubble on Swanscombe Marshes.

Mr Kitchener, as I have done, went looking for hybrids of fiddle dock *Rumex pulcher* near the permanent colony on Green Street Green (the one south-east of Dartford), and succeeded in finding two of the cross with curled dock *R. crispus* and one with *R. sanguineus* the wood dock. I was not successful, but I can boast a plant of ground-pine *Ajuga chamaepitys* of natural occurrence in my garden. Some years ago (Burton 1990: 140) I reported a single plant of small teasel *Dipsacus pilosus* near the lake at Lullingstone Castle. A flowering individual of this biennial was also visible two years after the first, but in subsequent years the site was covered in nettles and I despaired of seeing it again. However, in 1995 I realized that there is in fact a very large population of this very local plant on the shore of the lake, where it is visible only with the aid of binoculars. On 9 July, I took a small party from the Orpington Field Club to see the botanical sights of Farningham, and this demonstrated the advantages of the eyes of a small group of people over a single pair. A tuft of pale sedge *Carex pallescens* by a ride in Farningham Wood is the first ever seen in the area, a plant of *Ranunculus sardous* in front of the Lion Hotel was probably casual, and fiddle dock was observed by Horton Kirby cricket pitch, perhaps an additional consequence of the heavy use of the Darent Valley Path already mentioned.

## V.C. 17, Surrey

Mathew Frith, already mentioned under Kent, has also made a remarkable record a couple of miles away but only just in Vice-County 17, at the southern tip of the London Borough of Southwark. He sent me a photograph to support his identification of ivy broomrape *Orobanche hederae*, of which he found about thirty plants in Dulwich Upper Wood. Unless it is still present in Highgate Cemetery, this is now the nearest locality for it to the centre of London. Not much further out is the pond south of Tibbets Corner described to me as being on Wimbledon Common, though on my maps this is part of Putney Heath, and therefore in Wandsworth, not Merton, where a number of people independently found Hampshire purslane *Ludwigia palustris*, though I first heard of it as having been observed by Irene Kettle; this is not a native plant here as it is in the New Forest, but an aquarist's throw-out, and likely to persist only until it is crowded out by an even more invasive aquarium species, as happened in the Epping Forest locality described by Adams (1977). Morden Hall Park, undoubtedly in Merton, is where the Surrey Flora Committee had its July meeting; the best of their finds were three plants of *Ranunculus sardous*, here of doubtful status, in mown grass by the garden centre and one of corn chamomile *Anthemis arvensis* of even more doubtful status, also in grass; in a wet area they relocated the colony of brown sedge *Carex disticha*, one of the few surviving in London. Mike Mullin showed me a specimen of narrow-leaved ragwort *Senecio inaequidens* from a plant he had found on stonework of a bridge at Barnes Station, and also told me about a small patch of duck potato *Sagittaria latifolia* in the River Wandle behind Culvers Retreat near Hackbridge. The record of the ragwort is the second from London; last year I inadvertently omitted to mention a plant of it found by Mr Hounsome at the foot of a wall in a mews near Alexandra Park in Haringey, V.C. 21. There will surely soon be more. Margo Nagle reported celery *Apium graveolens* coming up in a tub outside the Iceland store in central Kingston.

After a remarkable hybrid found on Bookham Common, which will no doubt be referred to elsewhere in this journal, the first plant found in Surrey outside the London boroughs deserving a mention here must surely be yet another aquarist's throw-out, *Hydrocotyle ranunculoides* L.fil. Though not mentioned by Stace (1991), this is not quite a new plant for Britain. Details of its occurrence outside our area in Essex since 1990 are ascribed to a personal communication from myself by Clement and Foster (1994), but in fact were reported at the 1992 exhibition meeting of the Botanical Society of the British Isles (Heywood et al. 1993). It is most obviously distinguished from the native *H. vulgaris* by its leaves which are not attached centrally to the stalk, but at the margin in the usual way, though in mature plants the basal lobes each side of the attachment overlap and this character is not so evident as it is in the leaves of young plants which somewhat resemble those of *Ranunculus peltatus*. In Surrey it was first found by Barry Phillips in 1994, who gives a detailed account of its explosive spread the following year, with map and figure, in *The Surrey Recorder* (Phillips 1995). It now ranges from the millpond at Coxes Mill, where it rapidly formed a wide fringe all way round, down the Wey Navigation and so to the Thames. It has also been seen in the Essex part of our area, right across the River Roding and in three Epping Forest ponds. In view of the fact that it has been observed capable of radial increase by at least 5 cm daily, it is a remarkably rare species in its European range, being now restricted to at most three localities near the west coast of Italy and one in Sardinia (Tomei et al. 1986), though it is also widespread in the warmer parts of North and South America. In 1995 Mr Phillips also found a plant of pyramidal orchid *Anacamptis pyramidalis* on Chertsey Meads; he knows this area so well that this must be further evidence of its ability for long-range dispersal by seed.

Eileen Taylor gave me copies of 1994–5 species lists from the Howell Hill

Nature Reserve at East Ewell, which she looks after, and three fields adjacent to it. The 1995 element in the lists is all from the fields; one is the field which last year (Burton 1995: 173) I mentioned as supporting night-flowering catchfly *Silene noctiflora*, of which in 1995 there were about 18 plants, and also *Ranunculus sardous*. Another had loose silky-bent *Apera spica-venti* and 'common' cudweed *Filago vulgaris*. The flora of the third included the horticultural strain 'Milas' of corncockle *Agrostemma githago* and keeled-fruited cornsalad *Valerianella carinata*. *Ranunculus sardous* was also seen as a casual in Betchworth Quarry by the Surrey Flora Committee's June meeting. Our own meeting of 6 August found lesser water-parsnip *Berula erecta* in a small unmapped pond on Banstead Heath, and nearby *Lavatera olbia* of obscure status. Mike Mullin told me of a colony of three square metres of the garden climber *Akebia quinata* (Thunb.) Decne, for which I can find no English name, in a wood on a golf-course; he said Cuddington Golf Club, but from the other detail supplied it is clear that Banstead Downs G.C. is meant. Gwyneth Fookes found well over a thousand plants of penny-royal *Mentha pulegium* in land dug for a golf-course at Warlingham; it is tempting to suppose that this came up from buried seed, but the locality is hardly likely ever to have had it as a native plant and an introduction must be suspected. The plant is now rare as a native, but I understand from Tim Rich that there have been several recent reports of it as an apparently deliberate introduction, mostly in a form which is recognizably distinct from native plants by its more upright growth. Olive Maunder and Peter Coxhead confirmed the presence of saw-wort *Serratula tinctoria* on Banstead Downs, and counted fifty plants of broad-leaved cudweed *Filago pyramidata*, indicating the success of Plantlife's programme for the recovery of this rare species there.

## V.C. 18, South Essex

Denis Vickers sent me for identification two aquatic plants from the City Farm pond at Barking Reach (which we used to call Ripple Level); the pond was created about ten years previously, but has apparently been allowed to become vegetated naturally. One was spiked water-milfoil *Myriophyllum spicatum*, which is one of our commoner native aquatic species, the other blunt-leaved pondweed *Potamogeton obtusifolius* which is not. I spent an hour botanizing in Walthamstow, noticing a substantial patch of stag's-horn sumach *Rhus hirta* in a railway cutting and a single plant outside a garage of chimney bellflower *Campanula pyramidalis*, which would have been about two miles away from the one seen in Tottenham at about the same date by Brian Wurzell (Wurzell 1996). By Ferry Lane, Rainham, Alan Lewis, already mentioned under Kent, found abundant golden dock *Rumex maritimus* in a ditch and also one plant of *R.* × *knafii*, its rare hybrid with clustered dock *R. conglomeratus*.

The occurrence of *Hydrocotyle ranunculoides* in the Essex part of our area outside London has already been mentioned.

## V.C. 19, North Essex

George Hounsome found a single plant of summer cypress *Bassia scoparia* on a masonry plinth in a car park at Fishers Green, and got Eric Clement to confirm the identification of it. He also found a single plant of scaly male-fern *Dryopteris affinis* by a stream in The Warren, Epping Forest; the grid reference given makes it clear that a locality with this name in the V.C. 19 part of the Forest is meant.

## V.C. 20, Hertfordshire

Part of the London Borough of Barnet is in this vice-county, and includes Totteridge Common where Diana Griffith made what I believe is the first discovery of Des Etangs' Saint John's-wort *Hypericum* × *desetangsii* in Hertfordshire. In disturbed ground in Oak Hill Park Mr Hounsome found a curious mixture of plants, including frequent tufts of foxtail barley *Hordeum jubatum*, about fifty plants of thorn-apple *Datura stramonium* and a few of round-leaved cranesbill *Geranium rotundifolium.*

A very large number of records made during the Hertfordshire Flora Survey were kindly copied for me by Trevor James and I can give only a small selection of 1995 ones here. Mr James himself found a few clumps of tussock sedge *Carex paniculata* in a swamp by the Queen Elizabeth II Hospital at Hatfield Hyde, and in rough grass by Hatfield Aerodrome found common sedge *Carex nigra* and grass vetchling *Lathyrus nissolia.* There was another good colony of *C. nigra* in the Blackfan Valley south-east of Welwyn Garden City, which also produced other uncommon plants of wet places: brown sedge *C. disticha*, marsh marigold *Caltha palustris*, fen bedstraw *Galium uliginosum* and a large stand of blunt-flowered rush *Juncus subnodulosus.* A large colony of *Carex disticha* was found in a ditch near Home Covert, Cooper's Green, with whoried mint *Mentha* × *verticillata*, and in a dried-up pond nearby were several common water-crowfoot *Ranunculus aquatilis*, marsh-speedwell *Veronica scutellata* and tufted forget-me-not *Myosotis laxa.* With the Herts. Flora Group he found several slender thistle *Carduus tenuiflorus* and one cyperus sedge *Carex pseudocyperus* in Cooper's Green Gravel Pit, and in Oaklands Pit a little *Schoenoplectus lacustris*, and *Ranunculus aquatilis* in a lake, much water horsetail *Equisetum fluviatile*, occasional common spotted-orchid *Dactylorhiza fuchsii*, *Lathyrus nissolia* and a single small-flowered sweet-briar *Rosa micrantha.* Ann Boucher and he found a good range of plants in Bencroft Wood: three clumps of thin-spiked wood-sedge *Carex strigosa* by a stream, nine plants of violet helleborine *Epipactis purpurata* in two groups, a patch of woodruff *Galium odoratum* and single plants of two uncommon ferns *Dryopteris affinis* subsp. *borreri* and *Polystichum setiferum.* Graham White's tubular water-dropwort *Oenanthe fistulosa* and S. J. B. Knott's meadow saxifrage *Saxifraga granulata* in Hertford Castle lawns are also well worth a mention.

Mrs Boucher supplied a list of her own best finds of 1995 to me direct. Mr Kitchener and I saw two of her dock specimens, and agreed that a plant present in hundreds at the edge of playing fields at Waltham Cross was Greek dock *Rumex cristatus*, and that at Turnford on the bank of the Turnford Brook she had also found one plant of *R.* × *dimidiatus*, the hybrid of curled dock *R. crispus* and the former species, three or four plants of which were present. Outside Haileybury College gate she found the rarer subspecies *bonannii* of the strawberry clover *Trifolium fragiferum*, which she had also found at Cheshunt in 1994; I do not know of another record of this subspecies north of the Thames in our area. On a roadside west of Hertford she found two plants of *Allium senescens* L. determined by Gordon Hanson; presumably this species, widespread in Europe and cooler parts of Asia, was an escape from cultivation, though many other *Allium* species might be considered more ornamental. Mrs Boucher and Mr Hanson both had the opportunity to visit the sludge dumps at Rye Meads sewage works in 1995, a very good year for alien plants there, including two seedling date palms *Phoenix dactylifera*, single plants of senna *Cassia obtusifola* L. and prickly mallow *Sida spinosa*, much musk stork's-bill *Erodium moschatum* and a lot else.

## V.C. 21, Middlesex

Starting from the centre, the City of London has no natural habitats and only a small area suitable for casual plant records, though I did manage to find about fifteen *Ranunculus sardous*, one celery-leaved buttercup *R. sceleratus* and one bugloss *Anchusa arvensis* in sown grass near Ludgate Circus, and three plants of bur parsley *Anthriscus caucalis* in grass at Holborn Circus. The much larger City of Westminster was surveyed intensively by the London Ecology Unit under contract in 1995, and they made several discoveries which are noteworthy so far from rural areas where the species concerned are generally common, for example lady's bedstraw *Galium verum* at Marlborough House, lesser chickweed *Stellaria graminea* and thyme-leaved speedwell *Veronica serpyllifolia* in the Great Cloister, meadow buttercup *Ranunculus acris* in the Crescent Garden, Maida Vale, pignut *Conopodium majus* in St George's Square, Pimlico and grey sedge *Carex divulsa* in shady parts of Church Grounds, St John's Wood. For the quite separate natural history survey of the grounds of Buckingham Palace which the Society undertook to do, the plants were investigated by Elinor Wiltshire and David McClintock. A full report of the survey will no doubt be published in due course, so I will mention here only abundant *Galium verum* again and the first Middlesex record of Kraus's clubmoss *Selaginella kraussiana.*

I will take records from the London boroughs in V.C. 21 by starting with an inner ring, consisting of Tower Hamlets, Hackney, Islington, Camden, Kensington & Chelsea and Hammersmith & Fulham, followed by an incomplete intermediate ring consisting of Haringey, Brent, Ealing and Hounslow and ending with the outer boroughs Enfield, Barnet, Harrow, Hillingdon and Richmond-upon-Thames. In Tower Hamlets, Mr Hounsome found about twenty fruiting plants of henbane *Hyoscyamus niger* in a pig pen on the Mudchute Farm. I have no significant novelties to report from the next two boroughs, but Camden includes the patch of bell heather *Erica cinerea* found by Edward Milner and mentioned in his paper on the tube-web spider (Milner 1995: 134), where he surmises that it may be the only extant locality in the vice-county, justifiably as there are no recent records either from the Harrow Weald Common area or the Hounslow Heath area. On the Sandy Heath Mr Milner found a tree of alder buckthorn *Frangula alnus*; I have seen material of both these finds. Also just in Camden is the disused Whittington Hospital, where Mr Hounsome's finds included well-naturalized trailing snapdragon *Asarina procumbens.* From Kensington & Chelsea, John Swindells found London rocket *Sisymbrium irio* and a good-sized fig tree *Ficus carica* in a square off Kensington High Street, and John Topp reports that the insidious increase of California brome *Ceratochloa carinata* now extends to Brompton Cemetery. Mrs Wiltshire found a patch of this grass under a street lamp near White City Station in Hammersmith & Fulham.

*Campanula pyramidalis* in Haringey has already been mentioned. The hybrid of creeping yellow-cress and Austrian yellow-cress, *Rorippa* × *armoracioides*, was previously well known from the eastern margin of the borough and into V.C. 18 (Wurzell 1993), but Mr Hounsome found a small patch of it at the edge of playing fields north of Coldfall Wood. Leslie Williams's paper on plants of a locality in Brent is in this issue. From Ealing, Mr Mullin reports pride of India *Koelreuteria paniculata* 'still present and flourishing' by Bollo Lane, South Acton. Hounslow includes the long-disused Feltham Marshalling Yard which a kind member showed many people over during 1995. To the long list of species given by Cribb (1993) must now be added African love-grass *Eragrostis curvula*, a forage grass widely cultivated in warmer countries which has not previously been reported from the London Area. When Paul Bartlett and I had our tour, I was impressed by the great abundance of wood groundsel *Senecio sylvaticus* in the Pevensey Road open space to the south, part of which is now called the Peter Cribb Nature Reserve, and by the native-looking fringed water-lily *Nymphoides peltata* in the River Crane nearby. Another new species for the Marshalling Yard, perhaps inadvertently introduced by a visiting botanist, is *Ceratochloa carinata.* In a crack of the concrete of a bridge carrying Chiswick High Road, Mr Mullin has known a self-sown foxglove tree *Paulownia tomentosa* (Thunb.) Steudel of flowering size for five years, which I imagine is the basis for the mention of it in Stace (1991: 703); this Asiatic tree seeds itself freely in Paris, but I do not know of another British record.

In Enfield, Robin Blades told me about three-cornered garlic *Allium triquetrum* in Blagdons Lane, Southgate; the adjacent wall was too high to see whether it had been chucked over from a garden. Peter Holland and Margaret Kennedy made the astonishing discovery of six spikes of ivy broomrape *Orobanche hederae* outside Winchmore Hill Sainsbury's (you can't get it at our local branch!). Mr Hounsome's Enfield finds include a small patch of Indian rhubarb *Darmera peltata* by the brook near Turkey Street Station and royal mallow *Lavatera trimestris* on the side of an old nursery between Palmers Green and Arnos Grove. In Barnet he found abundant bur parsley *Anthriscus caucalis* in a recently levelled area by the Summers Lane dump, and Howard Matthews found alexanders *Smyrnium olusatrum* at the corner of Haverford Way and Roch Avenue. Last year (Burton 1995: 176) I mentioned the reappearance of hard fern *Blechnum spicant* on Harrow Weald Common. In 1995 Mr Matthews took other members of the British Pteridological Society to this area, and Patrick Acock found in the field immediately to the north more of this fern and a lot more wood horsetail *Equisetum sylvaticum* than was previously known thereabouts, as well as an established plant of sensitive fern *Onoclea sensibilis* in the grounds of the Grimsdyke Hotel. Sean Tobin's 1995 list from Bentley Priory includes a lot of quaking-grass *Briza media* previously overlooked because it had been eaten down by cows and several small patches of meadow-foam *Limnanthes douglasii* on bare ground near Boot Pond. Two Bridges Farm south-east of Heathrow Airport is just in Hillingdon; here Mr Mullin found whorl-grass *Catabrosa aquatica*, lesser marshwort *Apium inundatum* and slender tufted sedge *Carex acuta*. The first two had been feared extinct in London, and it is imperative that the pond here be kept free of *Crassula helmsii* and other invasive alien water plants. A little further west Mr Mullin found abundant dittander *Lepidium latifolium* on a mown bank. Peter Ellison and Ian Johnson independently sent me numerous records in connection with the BSBI's Atlas 2000 project, most of which are from Hillingdon. Mr Ellison collected orange foxtail *Alopecurus aequalis* at Ruislip Lido and common broomrape *Orobanche minor* in an old chalk quarry north of Summerhouse Lane, Harefield. In Springwell Lane quarry Mr Johnson found a clump of Mrs Robb's bonnet, the alien subspecies *robbiae* of wood spurge *Euphorbia amygdaloides*, and nearby good material of keeled-fruited cornsalad *Valerianella carinata*. Marsh mallow *Althaea officinalis*, water avens *Geum rivale* and meadow-rue *Thalictrum flavum* are all extremely unlikely plants to find on Ickenham Green, and their occurrence together is taken as a strong indication of deliberate introduction, probably by the National Rivers Authority; yellow-rattle *Rhinanthus minor* was there too and must be tarred with the same brush. The presence of Californian poppy *Eschscholzia californica*, pot marigold *Calendula officinalis*, nasturtium *Tropaeolum majus* and *Lavatera trimestris* on a recently built NRA flood bank by the Yeading Brook is more obviously artificial, and these records are irrelevant to the BSBI's project. There is also one record of my own from Hillingdon, in the Grand Union Canal southward from Uxbridge. I had noticed the hybrid water-plantain *Alisma* × *rhicnocarpum* here in 1990, but it was not until I went back there in 1995 that I realized that most of the water-plantains in this stretch of water are the hybrid. Readers who go there to look for themselves are advised to take with them a leaf and a flowering branch of the common species *A. plantago-aquatica* from another locality for comparison. Hampton Court is in the Middlesex part of the Borough of Richmond-upon-Thames, and on the stone bank of the tow-path here the 1 July meeting of our Ramblers Section made the remarkable discovery of a single plant of fine-leaved sandwort *Minuartia hybrida*, where it had previously been seen only in 1869 (Kent 1975). Mrs Nagle, who told me about this, herself found *Ranunculus sardous* on Buckingham Field, Hampton, where it might conceivably be native.

It has been pointed out to me that I have wrongly stated (e.g. Burton 1995: 177) that all of V.C. 21 is in London except for what is now the Spelthorne

District of Surrey. Of course part of the Hertsmere District of Hertfordshire, including Potters Bar, is also historically in Middlesex, and the Hertfordshire botanists have furnished some 1995 records from it. Mr James found water dock *Rumex hydrolapathum*, skullcap *Scutellaria galericulata* and common valerian *Valeriana officinalis* on Wash Lane Common, South Mimms. Mrs Boucher found a lot of the alien subsp. *ficariiformis* of lesser celandine *Ranunculus ficaria* on the bank of a stream by Potters Bar Golf Club car park; this large-flowered plant has bulbils like those of subsp. *bulbilifer* (Sell 1994) and can be expected to occur as a naturalized alien, so should be looked out for. In Potters Bar, Mrs Boucher found much spotted medick *Medicago arabica* on a verge and glabrous whitlow-grass *Erophila glabrescens* as a front-garden weed.

Records for 1995 from the Surrey part of V.C. 21 include knotted hedge-parsley *Torilis nodosa* observed on Penton Hook Island by the members of our South-West Middlesex Section on their 25 June outing.

### V.C. 24, Buckinghamshire

Most of the 1995 records in the database from the Buckinghamshire part of our area were made on 23 July. Our meeting then found a good range of plants in the disused gravel-pit north of Iver Station, and then went to the adjacent Slough Arm of the Grand Union Canal, where the plants seen included burnet rose *Rosa pimpinellifolia*, presumably introduced as it certainly is near the Lea tow-path on the other side of London in Newham. I missed the party, but made my own way along the tow-path, through Langley Park where I saw some, but by no means all, of the heathland species reported by Ron Boniface in 1978 (Burton 1979) and returned to London by way of Iver Heath where I was pleased to find subsp. *leersii* of grey sedge *Carex divulsa*, quite clearly not on chalk or limestone in spite of the comment by Stace (1991: 964) which no doubt echoes Jermy et al. (1982), and Smith's pepperwort *Lepidium heterophyllum* near the Five Points roundabout.

## Computerization of records

The plant records that I took over on the death of J. E. Lousley in January 1976 took the form of cards, one or more for each species, onto which he and others had written details of the more important discoveries. As I pointed out (Burton 1983) in my presidential address to the Society in 1982, which was Information Technology Year, this arrangement meant that the recorder's memory had to be relied upon for information on the cards about the flora of a given locality or the past activity of a particular recorder, and computer storage would be advantageous. During the early 1990s I began to develop the expertise, and acquire the equipment for other purposes of my own, to be able to make it possible to do something about it. By the beginning of 1995 I had decided on a database design and was able to start entering records. This is not the place for a detailed technical description of the database, which would in any case be unwise as to do so would only display my shortcomings as an analyst, but I can vouch that it will not be difficult for another person to take over from me, and report that so far I have been able to do all the things I want it to: I can retrieve all the records made of a single species and list them in a format which can be read by a mapping programme; all the records made from any vice-county (the need for this should be evident from my last year's report (Burton 1995)); all the records made from any London borough, or any of the modern counties represented in our area; all the records made by any individual person; all the records made in a single calendar year (as a basis for this report, for instance); all the records added to the database within a given period; or any combination of these criteria. It may be worth describing the principal table in the database, each line of which consists of one record. It consists of the following items:

**Record number.** A serial number, created by the computer to identify each record uniquely.

**Species number.** A number identifying the species. A list of all British species in alphabetical order, or a list of those occurring in the London Area in a systematic sequence, can be displayed on the computer screen at the same time as the record being added, so that it is only necessary to copy the number in order to identify the species being recorded. Adding common species to the records from a single locality, which was just not worth doing on record cards, requires at most five keystrokes each. The full name of the species, in its position in a standard systematic sequence if required, can be substituted in printed lists of records produced by the computer, by taking relevant data from another table in the database.

**Plant name.** In my 1991 report (Burton 1992) I listed species which I did not think were worth noting everywhere they appeared. For species not in those lists, I do in fact put in an abbreviation of the name as well as a number. When specifying the content of reports produced from the database it is possible to exclude records where this 'field' is blank.

**Locality.** This is a name taken from a standard list which is held in a different table in the database, indicating the vice-county, borough/county and grid reference (at the 10-km level only) for each locality. Some care has been needed selecting the names to be used in the standard list, which is far from complete, as there are still many parts of the area from which I have entered no records. We have two Green Street Greens which must be distinguished, two Chipsteads, two Pimlicos, two Rush Greens. Different names must be used for parts of a place divided by a vice-county or borough boundary. I intend in due course to complete the list, and allocate all the names which have appeared in other gazetteers of the Society to one of my standard localities. The database does not at present accommodate information about sites.

**Sub-locality.** This may be blank if no useful detail is available.

**Grid reference.** This field is always complete to the best level of detail available. It contains up to nine characters, all but the last of which are grid references of the type described on the Landranger and other series of Ordnance Survey maps. The first two characters are alphabetical, either TL (north of the $^{2}$00 grid line) or TQ. If the detail of the record supplied allows the plant to be located to within 100 metres, the next six characters are numerical. If the detail allows location to the nearest 1,000 metres only, the third and sixth numerical characters (which would represent the 100-metre definition) are replaced by dashes. The system can also accommodate records localized to the nearest 10,000 metres (10 kilometres) only, by replacing the second and fifth numerical characters also with dashes. The ninth character is a letter, providing a fourth possible level of accuracy, to the nearest 2,000 metres, the tetrad; the system of lettering used is that introduced by Dony (1967), which is on the way to becoming a *de facto* standard in Britain. This arrangement was proposed in the draft BSBI standard for transfer of computerized botanical records, but the published final version dated March 1996 leaves out the ninth character, the tetrad letter, which is useful when maps at this scale are to be based on records in the database. The Howell Hill Nature Reserve and adjacent fields, mentioned above under Surrey, are a good instance of the difficulty of fitting real sites into this system. The smallest of the fields just about fits within a single full grid reference TQ235619F, and one of the others is all in the same 1,000 × 1,000 metres square TQ23-61-F, but records from neither the third field, which is no larger, nor the nature reserve can even be placed in a single tetrad, so their grid references can only be given at the 10,000 metre level of accuracy, TQ2--6-- (tetrad letter blank). Records like Dr Griffith's *Hypericum* × *desetangsii* which have been located on a large-scale Ordnance

Survey plan can be given a grid reference pinpointing them to the nearest 10 × 10 metres, but this does not happen sufficiently often to be worth allowing for in the database.

**Status.** This is a character from a standard list, and allows an indication that the plant was deliberately introduced, casual, naturalized, native, or its status not known. It may be left blank.

**Botanist.** Represented by initials for the person or the society making the record. The full name appears in another table.

**Record year.** The year when the record was made. If a recorder reports having failed to find a plant where it was expected to be, I put a zero here.

**Notes.** Any additional information supplied by the recorder, which does not fit elsewhere in the record.

**Entry date.** This is added automatically by the computer.

## Acknowledgements

Mike Earp's and Diana Willment's assistance in different ways should be acknowledged here.

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# Obituaries

## LILIAN MYRTLE PEARL SMALL, 1907–1995

Pearl Small, described and recognized by many as one of the London Natural History Society's most indefatigable officers, died on 17 December 1995. It is fair to say that from 1954 to 1968 she was the representative face of our Society. As first assistant treasurer, and then general secretary, she carried out a vast range of duties including, in all honesty, some only just within her terms of reference; but how she worked, always available to advise, and, if necessary, to assume extra roles on a temporary basis, should another officer experience some difficulty. She had joined the Society in 1950, answering a call to address envelopes; soon she was helping with the collection of subscriptions. When Mr H. A. Toombs, her predecessor as general secretary, paid a long visit to Australia, she took over much of his work. Then, shortly after his return, he resigned, and Pearl was the obvious choice for the now combined post of general secretary and assistant treasurer. The day-to-day running of the Society was now effectively in her capable hands.

In 1958 she helped organize our Centenary Exhibition, and in 1959 became the first secretary of the Society's Administration and Finance Committee. In 1960 she was supervising the redecoration and refurbishment of our rooms at Eccleston Square; it must have been so frustrating for her when our landlords, the RSPB, decided to leave London and we found ourselves homeless. She spent hours and travelled miles seeking alternative premises, but still found time to organize one last Christmas party. The disappointment she must have felt was put aside as she sought a safe home for the Society's library. By 1962 she had got it out of store and installed in its new home at Ealing and available to members.

The spring of 1963 saw her deeply involved with the public showings at St Pancras Town Hall of the Society's colour film 'London's Birds'. In 1964 and 1965 she worked hard on an extensive revision of the Society's rules, but with the impending retirement of her husband Will, who had served the Society so well as its Transport Secretary, she decided to reduce her commitments, the vast range of which is best illustrated by the fact that the Society needed to create three new posts to deal with her workload, she herself taking on the role of Publications Sales Officer. At this point in her career she should, of course, have become president of our Society, a position which she would have filled with great dignity, and an honour which she richly deserved. The concentration of authority which she had been given by Council had, however, created some jealousy amongst some with small minds, and the honour was denied her. She was, nevertheless, elected an honorary vice-president in 1968.

Lilian Myrtle Pearl Sutton was born in Bristol in 1907, but at the age of eighteen months her family moved to Ealing where she lived for so many years. After attending North Ealing Primary School she won a scholarship to Haberdashers' Aske's School, then at Acton. She was a bright pupil, but despite achieving the requisite standard in eight subjects, she failed the matric French, and in the system prevalent at the time this meant failure, so her dream of a university place and subsequently becoming a teacher was dashed. So for her it was 'out to work'. She joined Stowell's the wine merchants, but like so many of her contemporaries became a victim of dreadful discrimination in that on her marriage to Will Small in June 1934 she was obliged to resign as Stowell's did not employ married women!

The birth of her daughter Joan in February 1939 changed her life, but her interest in all types of plants and gardens, presumably inherited and nurtured by her father who had founded the local horticultural society, remained. She had won many wild flower competitions in her schooldays, but her interest remained solely within the family. It was only after reading a letter sent by Ted Lousley to *The Times* that she felt the need for some wider involvement. With his guidance she joined the BSBI and the LNHS: her public work was about to begin.

In 1959 Pearl was elected to the Executive Committee of the Council for Nature as representative for the South East Region of England, and in 1964 she joined the Conservation Committee of the Council for Nature in addition to serving on its Council and Natural History Societies Committee. At about this time she agreed to co-ordinate the reports from local natural history societies interested in the development plan for the Lee Valley Regional Park. After 1968 her interests turned evermore towards conservation, and in that year she represented the Society at the conference called by the GLC in connection with the proposed Thames Barrage. Following the conference she was asked to prepare a list of Thames-side sites worthy of conservation. In 1970, European Conservation Year, Pearl was asked to organize our contribution. The result was a series of lectures, courses, films and public meetings of the highest order (a full report of ECY, written by Pearl Small, is to be found in *The London Naturalist, No. 51,* 1972).

The 1970s saw her as chairman of our London Nature Conservation Committee. For eight years, from 1972, she was also chairman of The Selborne Society, and worked hard to obtain statutory Local Nature Reserve status for Perivale Wood. The planting of trees in Oxfordshire given as a leaving present gave her great pleasure. To appreciate fully her efforts in the field of conservation it is really necessary to read the annual reports published in *The London Naturalist.* In 1979, after ten years in the chair, she felt she must do other things. She had founded the Small Field Club — groups of botanists who visited all parts of the country looking at all aspects of their hobbies and never forgetting the social side.

In 1981, Pearl, widowed in 1974, decided to leave Ealing and move to

Knebworth with Joan who had taken a job in Hertfordshire. From her home she ran botany classes for the University of the Third Age, and these continued until her health and sight became too poor. It was ironic that having failed in her ambition to be a teacher, she turned out to have a real gift for teaching: those of us who knew her and had the good fortune to attend her lectures or go on her field meetings would never have had any doubts on this score. She taught at WEA classes, lectured at Morley College, and gave numerous slide shows to Women's Institutes and the like.

She was a fine amateur botanist, firm in her opinions, but always open to persuasion — a tireless worker whenever there was a survey to be done. She had a first-class memory, not only for plants, etc., but also for people: she seemed to know everyone and, of course, everyone knew her. She was always at meetings, both indoor and in the field, and she was always available to help both young and old. Many a member or friend having some personal problem had cause to thank Pearl for the quiet advice given with no expectation of thanks, or recrimination if the advice was ignored or the problem got worse.

Without doubt Pearl Small was, in the history of our Society, a towering figure. The denial to her of presidential office was a disgrace, but her contribution to the cause of local natural history will never be forgotten, and we are all the poorer by her passing. On a totally personal note, her kindnesses towards my wife Barbara and myself would fill a book: we have lost a friend, but are grateful for having known, lived and worked with her.

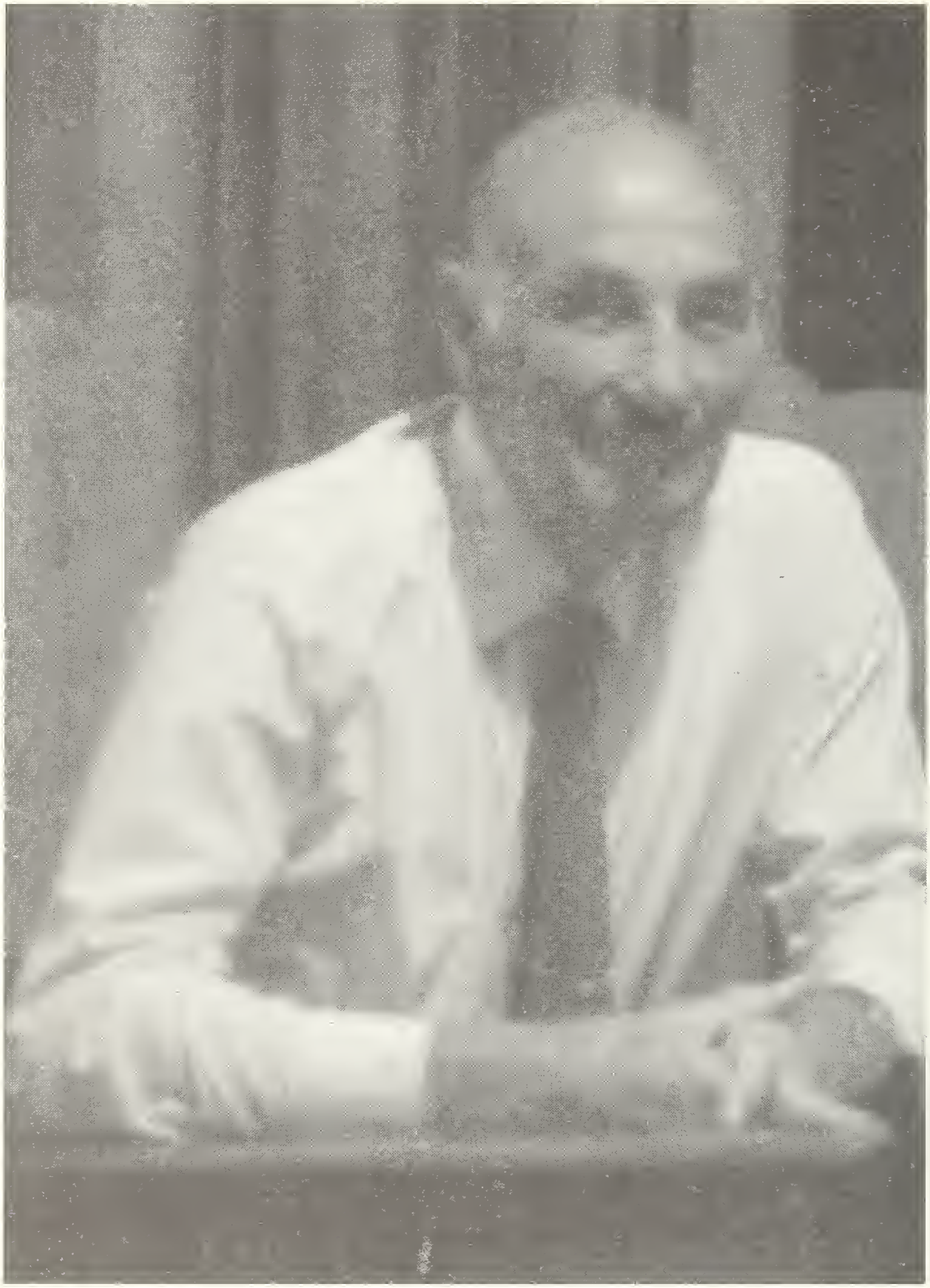
TONY BARRETT

## BERNARD LEONARD JOHN BYERLEY,
## 1913–1995

We were extremely sorry to learn that Bernard Byerley died on 23 December 1995 following a long illness. Bernard joined the London Natural History Society in 1953 and very soon established himself in the field amongst our entomologists, largely as a dipterist, and also as a first-rate photographer. It was not long either before he became involved in our administrative activities; in 1958 he played a large part in mounting our Centenary Exhibition which was held in Stoke Newington, at The Royal Exchange, and at Earlsfield. He was prominent at our twice-monthly Library and Collections evenings at 25 Eccleston Square and was one of the group responsible for co-ordinating our vacation from there when in 1961 the expiry of the RSPB's lease required them to move out.

Bernard's frequent attendance at indoor meetings soon led to him joining several committees, with the result that he became chairman of three of them, the Entomology Section, the Administration and Finance Committee, and *The London Naturalist* Committee. He was elected president of the Society for 1961 and 1962, the first entomologist to hold the post since Len Parmenter a decade earlier. In 1975 he was made an honorary vice-president of the Society. In September 1977, following his retirement, Bernard and his wife Win moved to Bratton Fleming, near Barnstaple in Devon, where they soon became involved in the local community. They were also always pleased to welcome visiting friends from the LNHS.

Bernard was born in Harlesden, north-west London, on 19 June 1913, and was educated locally. For most of his working life he was employed in the photographic industry, early with Criterion, makers of photographic papers, later with Ilford Ltd, and subsequently with Kodak Ltd. Here he began as a production supervisor in the Plate Department, and in this capacity his duties were classified during World War II as a reserved occupation, thus he remained in civilian employment. However, it was soon clear that his true talent lay in



solving technical rather than personnel problems, and in the late 1940s he transferred to the Research Division at Harrow where he remained until his retirement. Bernard was associated with several special product developments, in particular with a range of materials for recording nuclear particles. He had received no formal education in science, so working in a division staffed primarily with graduates he was to some extent constrained in career development. Realizing this, he was determined that others should have the opportunities that he was denied, and he became well known for his careful and methodical training of young laboratory assistants, many of whom went on to successful careers within the company.

In his pursuit of field entomology, Bernard joined other LNHS entomologists on holidays in Scotland, and it was on one such midsummer trip, whilst they were walking beside a river in a lush glen buzzing with insects, that they experienced a rapid drop in temperature as an icy-cold wind fanned the area. Suddenly, scores of dragonflies fell out of the sky onto them, their backpacks, their arms and their heads. Bernard and his companions sat in the sun, and, as the dragonflies warmed up, they flew away!

During his retirement Bernard was kept busy gathering photographic slides of the wildlife around Bratton Fleming, where he was regularly invited by local organizations to present natural history lectures.

Bernard made many friends in the Society: he was greatly respected by all who sat with him on committees, attended lectures with him, or joined him for a social hour afterwards. We extend our condolences to Win who shared many of his interests.

KEITH H. HYATT

## ANTHONY DAVID TOMLINS, 1923–1995

Anthony Tomlins first joined the London Natural History Society in the mid 1950s, and although he let his membership lapse for a while, he rejoined in 1980 and was still a member at the time of his death.

In 1958 he succeeded W. G. ('Bunny') Teagle for a ten-year stint as Bird Recorder for Inner London. He was eminently suited to that post as he not only lived there (he was a close neighbour of Stanley Cramp in Queen Square, Bloomsbury), but he had already contributed notes on the area's birds. In 1966 he and Cramp published in *British Birds* (**59:** 209–233) an excellent paper on 'The birds of Inner London, 1951–65', which was a sequel to the 1952 paper of Cramp and Teagle, 'The birds of Inner London, 1900–1950', also in *British Birds* (**45:** 433–456).

Subsequently Anthony moved from central London to Barnes and it was during this period that his membership of the Society lapsed. In the late 1980s he joined The 37 Bird Club and became its secretary.

Anthony Tomlins was born on 21 February 1923 and died on 14 November 1995. We extend our condolences to his wife Diana, their son Martin and their daughter Anne.

KEITH H. HYATT

# The London Naturalist

## Instructions to contributors

### Submission of papers

Papers should be submitted **in duplicate** to the editor, Mr K. H. Hyatt, at (preferably) his home address, or c/o Department of Zoology, The Natural History Museum, Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. However, the editor may be contacted at any time to discuss possible contributions, and will be pleased to send a recent offprint to show our style, and as a guide to preparing the manuscript. Manuscripts should be typed **double spaced** on one side of the paper only and with wide (3-cm) margins. Authors must retain a copy. Papers should include at the beginning an **abstract, summary** or **synopsis. Sheets must be numbered.** The editor would be pleased to receive contributions as ASCII files on disc (either $3\frac{1}{2}''$ or $5\frac{1}{4}''$) in IBM-compatible format as well as in manuscript as above. Papers should be relevant to the natural history and archaeology of the London Area. This includes comparisons between London and its surrounding countryside with other localities, as well as work relating to or comparing species or habitats which occur in the London Area.

### Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and **only** Latin names of genera and species must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. **Genus names should appear in full where first used within each paragraph.** When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 100 should be in words, except in a strictly numerical context. Dates in the text should follow the logical sequence of day, month, year, i.e. 25 December 1971, but in lists as 25.xii.1971. Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs, or St. Lists should be in systematic, alphabetical or numerical order. **Hyphens should not appear at the end of lines. Tables should be typed on separate sheets at the end of the text. Word-processed text should not use italic, bold or compressed typeface. Paragraphs should be indented.**

### References

Reference citation should be based on the Madison rules (*Bull. Torrey bot. Club* **22:** 130–132 (1895)), except that a colon should always precede a page number. Capitalization in titles of books and papers in journals should be kept to a minimum. Journal titles should be in full or follow the abbreviations in the *World list of scientific periodicals* and be underlined. Book titles should also be underlined.

Examples are as follows:

In text:

Meadows (1970:80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964–9. *Lond. Nat.* **49:** 76–81.

MELLANBY, K. 1970. *Pesticides and pollution.* Ed.2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39–45.

**Authors must ensure that all references are cited accurately:** they will not be checked by the editor.

### Illustrations

Distribution maps should be submitted in the form of a recording map with symbols in Indian ink and stencilled or by transfers, e.g. 'Letraset'. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. The caption should be written outside the frame of the map and will be set up by the printer.

Line drawings should be in Indian ink on white card or tracing paper, larger than the printed size, but no larger than A4. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer, but keys that include special characters should be included within the border of the figure.

Photographs should be glossy black-and-white prints, of good contrast, preferably plate or half-plate in size, or, following consultation with the editor, in the form of colour transparencies, either 35 mm or larger. Colour prints are also suitable for reproduction in the text in black and white.

### Proofs

Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

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